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TO

"FARMING IN SOUTH AFRICA."

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*(The asterisk * denotes that the article is illustrated.)*

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[*Photo on Cover by S.A.R. & H.*]

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section, supplies information on crop prospects, market prices and exports of agricultural produce.

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Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor

A New Year's Message.

By Col.-Comdt. the Hon. W. R. Collins, D.T.D., D.S.O.,
Minister of Agriculture and Forestry.

AS the years of upheaval pass, I find my admiration for the Union's farmers grows and so does my pride in their achievement. With many absent on war duties, the remainder have produced the essential food requirements of the country —this despite a shortage of labour and the difficulties in obtaining the requisites for production.

The present season has been ushered in by good rains. This, together with assured and equitable prices for the main farm products, gives promise that the country will be adequately provisioned with the chief foodstuffs for another year.

Those closely associated with Nature acquire patience and fortitude, attributes which give stability to society—and in this crisis the attitude of our rural population has supported this contention. Hardships have been faced with quiet resignation, determination and reasonableness.

Knowing the spirit of the people, I am certain we can face the coming year with confidence. To all I extend the very best of good wishes for 1944.

W. R. Collins

Minister of Agriculture and Forestry.

Overheating and Chilling of Chickens.

J. D. W. A. Coles, Veterinary Research Officer, Onderstepoort.

IF anybody were to ask what single cause is responsible for the greatest number of deaths among chickens, the answer would deal exclusively with the temperature of the brooder. Infectious diseases do wipe out chickens by the thousand, but incorrect temperatures are responsible for very many more deaths. The usual story is: "I put a magnificent lot of chicks in the brooder-house, and now they are dying like flies. Some have diarrhoea, while some just twist their necks, stagger and then die. I'm sure it must be bacillary white diarrhoea". The cause is a far simpler thing than bacillary white diarrhoea, and the following description reveals the essential details.

Symptoms.

Overheating.—The chicks get as far away as possible from the source of heat, but later may even approach it. The wings are outspread. The chicks gasp, sweat and have an offensive odour. Some get diarrhoea, and die; others get spasms of various muscles, and twist their necks, etc. Deaths may occur at any time within about a month after the exposure to excessive heat, though most deaths take place within three or four days. Survivors have their growth checked, and the adult flock is weakly and uneven in size.

Chilling.—The chicks huddle so close together that those in the middle of the clump, or those that get pushed into the corner, are crushed to death. Those that are alive in the morning look mopy, and soon develop diarrhoea. Death may occur in anything up to about a fortnight, though here again most succumb during the first few days. Survivors grow unevenly, and never make a flock that the owner can be proud of. They usually develop into culls.

Diseases Mistakable for these Conditions.

Other diseases which can be mistaken for these conditions are the following:

Bacillary White Diarrhoea.—If some of the chicks are dead in the shell, if some hatch, look sick, and die on the first day, and if deaths are fairly numerous during the first week after hatching, you are justified in suspecting bacillary white diarrhoea.

Bacillus aertrycke infection.—This is an infectious disease sometimes seen in chicks about one to three weeks old. The symptoms rather resemble those due to overheating, and a bacteriological examination of the blood is necessary before it can be said definately whether the disease is present or not.

Aspergillosis (Brooder-house pneumonia). To-day, this is rarely seen. The disease usually attacks chicks in damp, musty brooder-houses, especially if the litter is at all mouldy. The casual mould will be found when material is examined microscopically.

Aegyptianellosis.—This is sometimes seen in chicks two to three weeks old. The chick is very mopy, and has a bright-green diarrhoea. The disease is due to a blood parasite transmitted by the tampan, and is very fatal.

Spirochaetosis.—This is occasionally seen in chicks over a week old. They are mopy and have a greenish diarrhoea. The blood parasite causing it is transmitted by the tampan. The disease is usually fatal.

 [Continued on page 6.

FARMING IN SOUTH ...AFRICA

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A New Year's Message.

Dr. P. R. Viljoen, Secretary for Agriculture and Forestry.

A CHARACTERISTIC feature of the war so far has been an ever-increasing production—our country needed more products and farmers satisfied the demand. Because of the shortage of fertilizer much of this production was inevitably obtained at the cost of soil fertility, and in many cases inferior land which should perhaps rather have been left unbroken was utilized.

The food position continues to be critical and a further increase in production will be required from our farmers in order to satisfy not only local requirements, but also to some extent, the demand for food of the starving nations in occupied territories. In repeating our request for an increased production this year, I should, nevertheless, like to warn our farmers not to exhaust their soil to such an extent so as to render the restoration of its fertility difficult. I should further like to appeal to them not merely to impoverish but, as far as circumstances permit, also to build up their soil: make compost, use kraal manure and store all vegetative refuse on the farm for incorporation into the soil, even if the work has to be done in spite of scarcity of labour and even if it entails higher production costs, since the adoption of such a policy will be justified by future profits.

The retention of soil fertility and the protection of our national agricultural resources should lie at the root of any post-war reconstruction plan for our agriculture—a problem which has occupied the attention of the Department for the past twelve months and in respect of which sufficient progress has already been made to allow of the submission of a report to the Government. The Department intends to consult organized agriculture on the report and I cherish the hope that perfect agreement will be reached on this important matter.

I trust that the new year will bring not only unanimity on all important matters relating to the future of our agriculture but also actual progress.

That 1944 may see you happy and prosperous is my sincere wish.

Secretary for Agriculture and Forestry.

"Foods and Cookery", Bulletin No. 115, is out of print.

Bulletin No. 237, "Eggs and Poultry in Cookery", which contains many useful recipes, is obtainable at 6d. per copy from the Editor.

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin No. 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Overheating and Chilling of Chickens:—

[*Continued from page 4.*

All the above-described diseases can be established definitely by an expert only.

Avoidance of Mortality due to Chilling and Overheating.

To avoid mortality due to chilling and overheating:—

Do not let the chicks out on a bright morning when the air is still chilly.

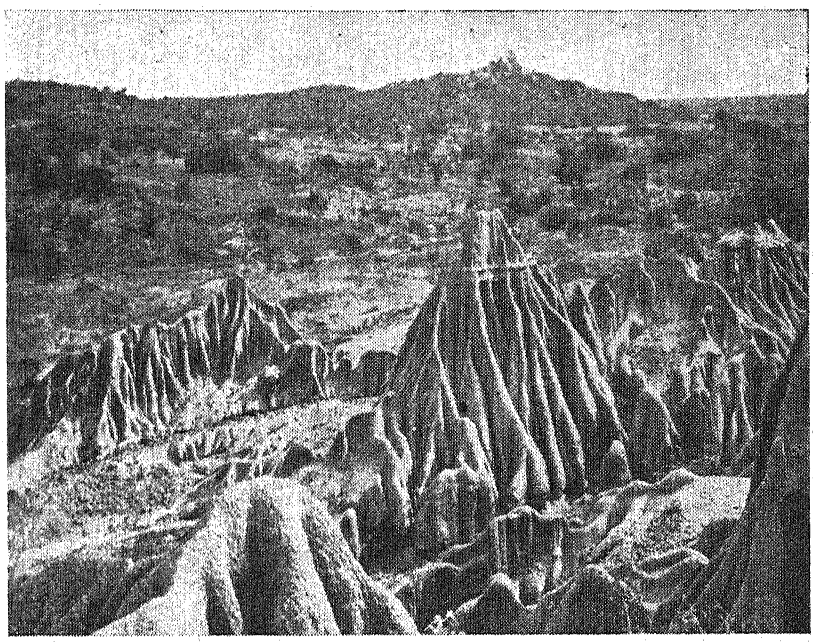
Do not expose chicks to draughts, but provide good ventilation. The temperature required by chicks under the hover during the first week is 90 to 95° F., during the second week, 85 to 90° F., and in the third week, 80 to 85° F., while in the fourth and fifth weeks it should not deviate more than a degree or two from 70° F. The temperature in the brooder-house during the first 6 or 7 weeks should not fall below 65° F.

Visit the chicks as often as possible during the day and night, to see that they are comfortable and not crowding together or gasping for fresh air. Most chickens brooded in boxes in kitchens are chilled between 3 and 6 a.m.

Save our Soil!

IN the following radio talk, Mr. Louis Esselen, member of the National Veld Trust, appeals to the people of South Africa to join in a campaign for combating soil erosion. We must fight to safeguard our national existence, and if we do not succeed, then the desert will succeed. Mr. Esselen's appeal reads as follows:—

" For many years we have heard and read a great deal about soil erosion. Recently thousands of us have seen a striking colour-



Erosion in River Bed.

[*Photo: S.A.R. and H.*

film prepared and shown by the Division of Soil and Veld Conservation of the Department of Agriculture and Forestry—a film I aptly named ' South Africa in Danger—There is a Red Light '. I say *aptly*, because South Africa is really in danger, and the sooner all of us awaken to that unpleasant truth the better it will be for the future of our young nation. ' Social Security '—the term has already become a by-word with our people—has captured the imagination of the country, but what truly abiding social security can there be for man or beast if the vegetation, soil and water of our heritage are not valued as something altogether beyond price, and are not kept *secure* for the *society* of posterity? We are dealing here with values that, once squandered, are largely irreplaceable, or at most replaceable in part only and at a terrific price in human endeavour, and hard cash. Can there be social security if there is no soil security? Most decidedly not.

For more than forty years I have travelled widely in the Union, and all the time I have kept my eyes and ears open in an attempt to understand somewhat better the setting, the nature, the merits, the weaknesses and the besetting problems of our fascinating and

varied country. I am therefore able to tell a faithful story of the *drama*, no, the *tragedy*, of our misdeeds of recent times, misdeeds acting at an appalling rate, that have scarred so much of the one-time beautiful face of the earth with marks of brutal treatment, wastage and poverty. Mother South Africa has lost her smile: we have treated her undutifully. While it is true that undisturbed Nature has no lack of time, that a million years to her are as nothing, it is equally true that man may, in a few brief years, set in motion influences that increase amazingly fast in the momentum of their effects. Thus it is that in forty years—a short span for Nature—I have been able to witness so vast a change in so many of the details of the plant cover, the soil conditions, the water-supply, and the agricultural possibilities of South Africa.

I could take you, for instance, to a place, which, not so long ago, was a beautiful farm, rich in vegetation, having a large vlei with deep pools in which hippos abounded. To-day it is a *man-made* desert; a waste land. The vleis have been replaced by deep—yes, thirty feet deep—dongas! Or again, I could take you to a large area in the northern Transvaal, once a very beautiful country, now ruined by wrong farming methods; or we could go to other places where our roads and railways as a result of inefficient drainage methods are doing harm that it will take all our skill and ingenuity to repair.

Wherever we turn, piracy of the soil (in Afrikaans we have a very appropriate word for it, viz., ' roofbou ') is being enacted before our eyes. Poor Mother Earth is not treated as a Mother, but like an enemy! We are taking—I prefer to say *stealing* things that should be a sacred trust, things that we really should be treasuring for generations yet unborn. Nature will respond if we only give her a chance.

Look at some of our bare and scarred mountains—once beautiful to behold, thickly wooded, with crystal-clear streams flowing from their well-protected vegetation sponges and kloofs—to-day lying naked to the rigours of burning sun, drying winds, and torrential downpours, naked like the roof of a house because we have robbed them of their plant cover and their soils.

When any one speaks of ' Soil Erosion ', do not imagine that the subject implies the formation of dongas only; it means far more—in fact it covers the whole wide field of deterioration and wastage of our resources of vegetation, soil, water-supply induced by the activities of man and his associated flocks and herds.

Owing to the physical structure and chemical composition of the surface of the earth and to the nature of the climatic agencies of heat and cold, moisture and dryness, evaporation of moisture and the prevalence of winds, there is always a certain degree of *natural erosion* taking place. This is particularly true of the arid and the semi-arid portions of the world, but to a much more limited degree is true even of well-watered, temperate parts of Europe. In South Africa, with its varied climates and general prevalence of bright light, extremes in heat and cold, and tendency towards semi-dryness, the rate of *natural erosion* is not inappreciable. Now man, through various activities, has accelerated or *quickened the tempo* of erosion; he has, indeed, brought about *accelerated erosion* and it is this kind of erosion that is doing so much damage to our national heritage. I know that many persons think that dongas and dongas alone are the results of soil erosion. Actually there is a far more subtle enemy—one might almost call it the agricultural Fifth Columnist

in our midst—and it is known as 'sheet erosion'. This process actually is the outcome of uncontrolled grazing, often coupled with indiscriminate ploughing and veld burning. Sheet erosion is brought about by the abrasive or 'wearing-away' action of dry winds. In parts of the Union, for example, there was very serious loss of soil by wind erosion during the serious drought of 1933, but each year some toll is taken by the prevailing, warm, dry winds of spring and the cold winds of winter. Wind and water may act jointly in bringing about bare, hardened areas that support nothing but the hardiest pioneer plants. Unfortunately such hardy pioneers often are either grazed off by hungry stock or are poisonous or otherwise troublesome weeds.

Upon my brother townsman I want to impress this thought: he must not say, 'Well, all this does not concern me'. He must realise that South Africa, in keeping with every other country, can never enjoy a truly successful industrial, commercial and social life without a soundly-based agriculture. And this is not only because of the material values a nation wins from the soil, but because the soul of a people cannot keep in tune with those health-giving, dignifying moral values that Nature holds, if that people has deserted the land because it has made that land a *desert.*

Let my fellow townsman realise as he sits at his breakfast table, that everything he is eating, practically everything he is wearing, and almost everything in the room is supplied by Mother Earth, by means of her atmosphere, soils, water, plants and animals.

If he still is not interested, let us touch him on a tender spot—his pocket! I am sure he is listening now! Maybe he read a portion of the report of the Industrial and Agricultural Requirements Commission. If so, he will have seen the following:—

'Financial assistance given to South African agriculture reaches large total figures. *Excluding* the exceptionally low railway rates usually charged on farm produce, the State has spent 25 *million in ten years* (1931-1941) in *direct* assistance and subsidies to farmers.'

I emphasise the word 'direct', but I could point out many directions in which his pocket is also affected 'indirectly'. I mention this to show how interlocked our interests are, and that it is just as much a concern of the urban population as it is of the rural. In fact—we are all vitally concerned. It is a war we have to wage, and an 'all-in' war.

To my brother-farmer I also want to give a few facts. In the year 1941-42 eight million pounds worth of farm produce and over five and a quarter million pounds worth of livestock were conveyed over the railways of the country. Just try to think how much must have been taken from the soil to produce so much produce and stock. If you care to enquire and calculate what proportion has been put back into the soil you would be most seriously alarmed: we are *mining*, not *farming!*

Both townsman and farmer may be asking whether there are no special steps that could be taken by both the State and by the various groups in the community to slow down, to put an end to the alarming wastage of soil and water. Actually there are various methods of control and combat (with which our experts are making themselves more familiar). They include such important matters as control of veld burning, or burning at the right season and at suitable intervals; veld management and rotation; the introduction of improved methods of field husbandry and crop rotation; the

making and the wise use of more and more compost and manure, and the intelligent use of fertilizers; the protection of our watershed and catchment areas against fire, axe, and stock, and the better disposal of flood waters from our roads and railways; limiting or rather giving no credit or assistance to the pirates; education and propaganda must naturally play an increasingly important part in bringing about a national 'conscience' in this matter. We must become soil conscious.

An organisation aiming at assisting the State and its people to realise the problem in its immensity and to grapple effectively with it, has now been formed—'The National Veld Trust'. Among other functions this Trust has as its object:—

(*a*) (i) To promote the conservation, development and improvement of the natural resources of the Union of South Africa;

(ii) To advance, assist and encourage the preservation, protection and amelioration of the veld, the soil, the surface of the land, the vegetation and the sources of the water supply of the Union of South Africa.

And for the purpose of carrying out the said main objects:—

(*b*) To awaken and educate public opinion and to collect and disseminate information in support of any of the objects of the association.

. . . and with this appeal I am thus making a beginning in awakening, educating *and mobilising public opinion*. That is the first step and, once that is accomplished, leadership and direction will be given so that this tremendous task shall be tackled in a business-like and proper manner. The whole population of South Africa will be the army, and everyone, no matter what race, colour or creed, will have to do his bit. The task of land salvation is far too great for any one Minister or for any one man—or even any two or three State departments. It is, let me remind you, an 'all-in war'. If we don't win, the desert will!

The head office of the Trust has now been opened in Bloemfontein and I conclude this talk with an appeal to you to join up and become an active member of the Veld Trust."

(Sgd.) LOUIS ESSELEN,
Member of the National Veld Trust.

SHORTAGE OF TETROL.

THE Director of Veterinary Services, Onderstepoort, announces that owing to the shortage of one of the ingredients of tetrol it is at present no longer possible to prepare supplies of this remedy. In view of the prevailing war conditions, it is extremely difficult to say when supplies will be available again, but as soon as this Institution is able to resume the preparation of tetrol, the necessary notification will be given in regard to the matter.

Farmers are therefore requested not to place any further orders since any money forwarded, must merely be refunded.

The Nut Grass (Uintjie) Pest.

A Survey of the Habits of Growth, Propagation and Control of Nut-grass.

W. B. du Preez, Department of Agronomy, Agricultural Research Institute, Pretoria.

YELLOW NUT GRASS (*Cyperus esculentis*) known in Afrikaans as geeluintjies and nut grass (*Cyperus rotundus*) undoubtedly constitute a grave menace to the grain-farmer since their extensive increase necessitates constant hoeing of lands to prevent serious crop losses. Ordinary harrows and light cultivators which can be success-

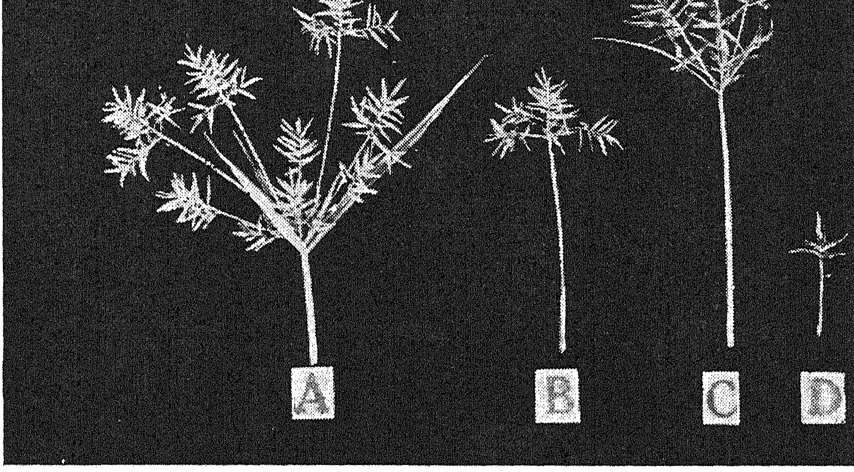


FIG. I.—Inflorescence of nut grass ¼ the normal size.
A. Double compound inflorescence of the yellow nut grass.
B. A compound plume of the same plant.
C. Single inflorescence of the ordinary nut grass (uintjieskweek).
D. A plume of the same plant.

fully employed for controlling annual weeds during their early stages of growth are practically useless in the case of nut grass. In order, therefore, to give the crop a reasonable start, intensive hoeing at short intervals from the time of planting is essential.

It may be interesting to learn that nut grass (*Cyperus rotundus*) is a cosmopolitan weed which is even more troublesome in the U.S.A., Australia, Northern Sudan and India than in this country. It has been estimated that nut grass reduces the yields by 25 to 30 per cent. in the fertile Indian districts(1). In these countries extensive experimental work has been carried out with a view to finding a control measure, but so far no practical acceptable method has been established.

The term nut grass.—The general term "uintjie" does not denote any specific *Cyperaceae* species, and in view of the habits, maintenance and propagation of the different species, it will be necessary to deal with each on its own merits when considering a suitable control measure.

Some people may not be familiar with the term uintjieskweek, but according to Henning of the Stellenbosch-Elsenburg College of Agriculture, the species *Cyperus rotundus* is generally known in those parts as "uintjieskweek", "steentjieskweek" or "Oos-Indiese kweek". It will be noticed that the suffix "kweek" is appended to each of the Afrikaans names. This is due to the perennial subterranean system which *Cyperus rotundus* has in common with quick grass (*Cynodon dactylon*) (kweekgras), and which perpetuates their existence as weeds. Furthermore, there is some similarity in their leaves both externally and anatomically and finally, it is an indisputable fact that of the species of nut grass and quick-grass (*Cyperus rotundus*) and (*Cynodon dactylon*) are the most troublesome. To prevent confusion the writer uses the word *nut grass* which refers directly to the nut grass family, and according to the above explanation, to the specific species *Cyperus rotundus*.

Two Important Species.

According to information and samples obtained from the various Colleges of Agriculture and experiment stations in the Union, and according to personal observations, two species of nut grass appear to be particularly troublesome in cultivated lands, and for control method purposes it is essential to differentiate clearly between the two species. A comparison will now be drawn in broad outline between the two most important nut grass weeds, viz. (1) Nut grass (uintjieskweek) (*Cyperus rotundus*) and (2) the yellow nut grass (*Cyperus esculentus*).

Yellow Nut Grass.

Yellow nut grass (*Cyperus esculentus*) derives its name from the straw yellow veins in the inflorescence, in contrast to the dark-brown to rusty red veins peculiar to *Cyperus rotundus* grass. The following are further striking differences in the inflorescences.

The inflorescence of the yellow nut grass has a wider circumference, the panicle stalks are longer, and each panicle in turn is compound. If taken as a whole, therefore, this species has a double compound inflorescence, in comparison with the single inflorescence of the other nut grass species (see Fig. 1).

In so far as the subterranean system is concerned, the differences between the two species are even more pronounced. *Cyperus rotundus* is equipped with a wide, deeply ramified root system, corms, basal bulbs and connecting rhizomes (see Fig. 2). The corms are bitter to the taste, due to tannin-producing sacs inside the cortex tissue. At a later stage these corms become hard and black, and, as a result of lignification, the rhizomes have a thin and stringy appearance.

The *yellow nut grass* (*Cyperus esculentus*) on the other hand, has a growth habit which bears a close resemblance to that of the potato, especially as regards its bulb formation. The stem forms no basal thickening under the ground surface like the ordinary nut grass (*Cyperus rotundus*) and as soon as the parent plant starts flowering, new, tender white bulbs form singly at the ends of the thin shoots (see Fig. 3). When these bulbs ripen they become disconnected from the parent plant, and during the following season usually only a single plant sprouts from each bulb. Almost simultaneously with the development of new bulbs, the old bulb (the parent bulb) reaches a stage where it is spent and at a later stage wholly decays. At this stage the young bulbs are immature and tender, and the old one has lost its sprouting capacity. The plant has, therefore, reached a critical stage since uprooting and exposure to the sun will result in a

high mortality. This period, which lasts approximately from December until late in January, is the weak link in the life cycle of yellow nut grass.

An effective method of cultivating, carried out at a judiciously chosen time, will therefore effect a maximum eradication of this weed. If the plough is followed by the harrow to bring as many plants as possible to the surface, and the process is repeated later in the season when new growth has been formed (due to new bulbs which have not yet sprouted), yellow nut grass will be eradicated completely.

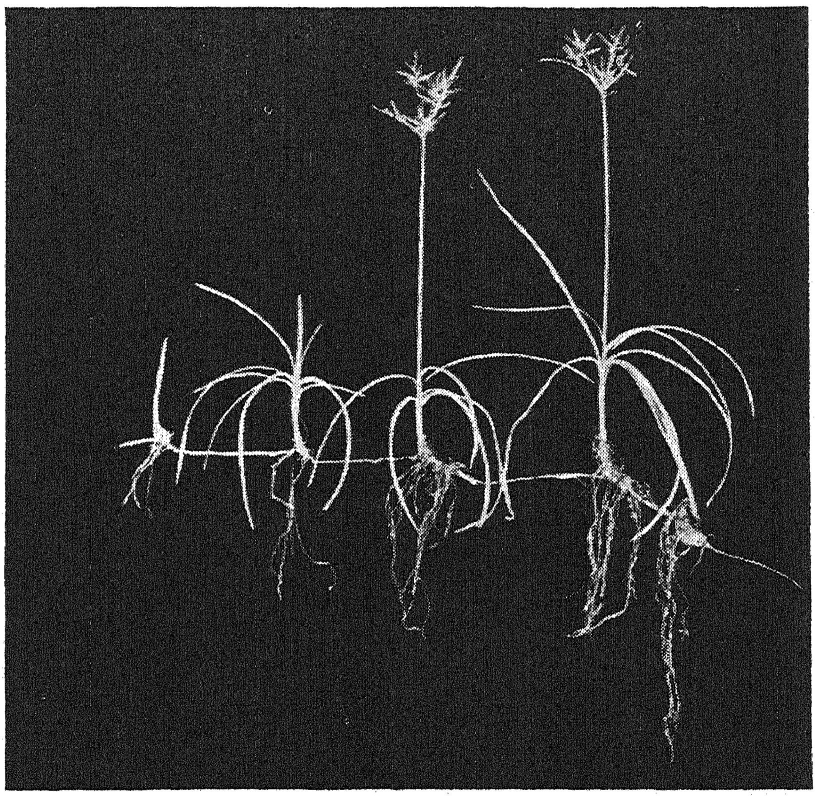


FIG. II.—Nut grass (*C. rotundus L.*) $^1/_5$ its normal size. Note the basal bulb system and the way in which new plants develop.

Note that the adoption of such a method gives the plants no chance of forming seed, and further, that a winter cereal, e.g., oats, can be grown on such cultivated land. This implies that it is not absolutely essential to leave the land untilled and sacrifice the produce of a season. What happens in practice, however, is that the summer crop is already on the land when the yellow nut grass starts flowering, and that many nut-grass plants which cannot be reached with the cultivator, remain intact and serve as a source of infestation for the following year.

What applies to the yellow nut grass does not, however, apply to common nut grass (uintjieskweek) with its perennial subterranean system which, during the life of the plant, forms an unbroken chain. For this reason it offers exceptional resistance to any form of eradication.

typical of the surface system. The results of a nursery experiment carried out by Smith and Fick([5]) of the U.S.A. showed that within $3\frac{1}{2}$ months as many as 146 tubers and basal bulbs developed from a single bulb.

The surface system is exclusively a basal bulb arrangement in an unbroken chain below the surface and accounts for practically all aerial growth. This system develops every season from the first-formed basal bulbs—a process in which the rhizomes grow horizontally below the surface in all directions forming at irregular distances soft, white bulbs, which are clearly divided into internodes and nodes and are fitted with bracts. On further development the bracts disappear and the epidermis thickens.

In the case of each of these bulbs there again occurs a definite end-node domination, i.e., the bulb at the end first sprouts and this gives rise to the aerial leaf growth of the new plant; next the node just below the end node sprouts and forms a rhizome which in turn forms bulbs having exactly the same habits as the previous basal bulbs. These tubers, therefore, act in a manner similar to the basal bulbs but differ from the original parent basal bulbs in that the tubers are first formed, and the leaves subsequently (Fig. II).

In cases where the surface growth is destroyed by hoeing or by spraying with chemical materials, the first task of the basal bulbs is to form new plants, since no new tubers can be formed when the vegetation has been destroyed. A number of rhizomes are now formed to renew the leaf-growth. Each one of the new plants *again* forms a basal bulb about $\frac{1}{8}$ inch above the old bulb. The formation of basal bulbs, therefore, appears to be an essential condition for sustained growth.

Although the dormant tuber system does not play an active rôle in the rapid spread of nut grass, it nevertheless fulfills the essential task of guaranteeing the survival of the plant after the surface system has been destroyed. An effective control measure will, therefore, have to aim at destroying this deep tuber system.

The Control of Nut Grass by means of Soil Cultivation.

Experimental work has proved that nut-grass tubers which are exposed to desiccation lose their sprouting capacity as soon as the moisture content of the tuber decreases from the normal average of 55 per cent. to 15 per cent.

The desiccation process is effective only if the following conditions are satisfying:—

(1) *The tubers must be completely severed from their root system.*—It has been observed that tubers which were found on the soil surface, but which still were connected with the deeper tubers and the root system, sprouted normally after having been exposed to sunlight, dry air and even frost lasting right through the winter and for a period of 6 months.

(2) *Dryness of soil.*—An uprooted, single tuber will not desiccate on moist soil, but will immediately take root and sprout. According to Andrews([6]) 20 per cent. of soil moisture is enough to keep a tuber alive for a considerable period but as soon as the soil moisture content drops to 16 per cent., most tubers die after a period of 5 weeks. If the soil moisture content is 8 per cent., which coincides with the permanent wilting point of the soil maximum mortality occurs within a short period.

(3) *Dryness of air.*—It has been observed that nut-grass tubers which had been taken from the lands by harrows and dumped on

head-lands or hard roads, sprouted and took root during moist weather. This is another proof of the uselessness of trying to control these weeds by cultivation methods during the rainy months.

The results of a controlled desiccation process indicate that tubers, when exposed direct to the sun, lose their viability after 8 days, but that in cloudy weather they retain it for as long as

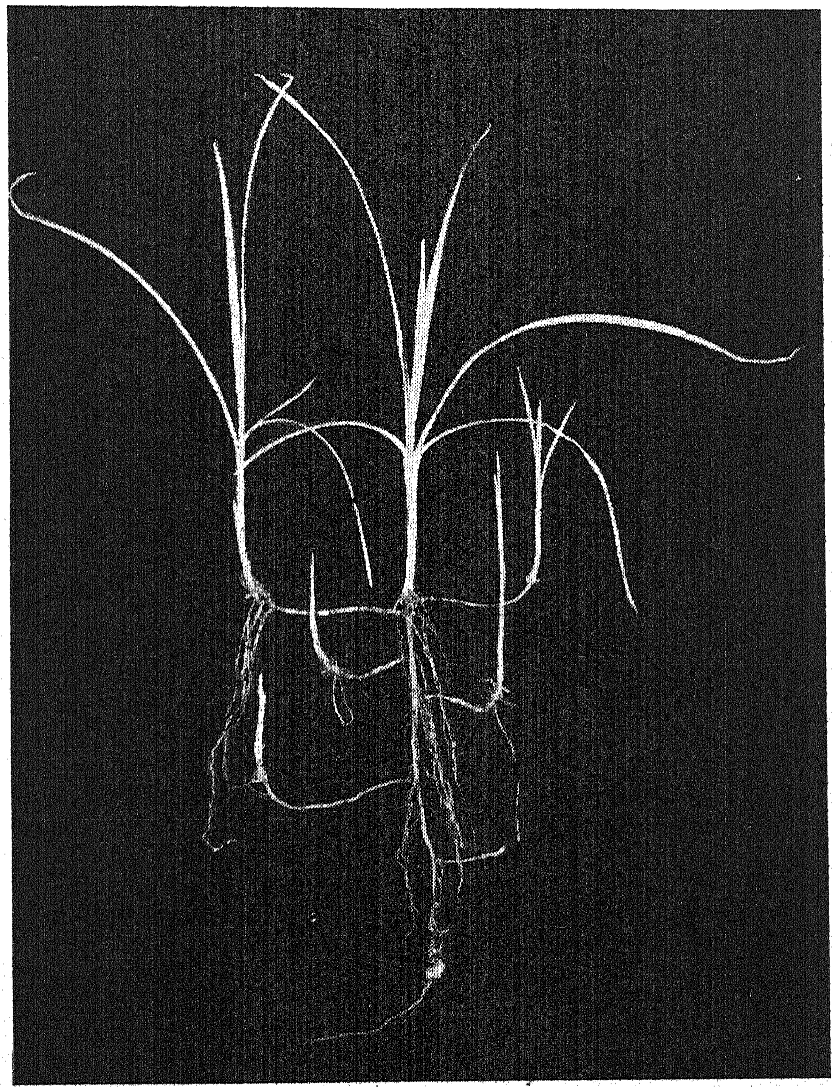


FIG. IV.—Nut grass plants (uintjieskweek) which developed from a deep-lying tuber. Note the plants and roots which develop from nodules of the upwards growing rhizome.

14 days. Since the intensity of the sunlight and the moisture content of the atmosphere varies from day to day and from season to season, it is impossible to predict exactly how long the tubers will retain their viability. Furthermore, the age of the tubers also plays a rôle, since the young, tender tubers are more inclined to desiccate than the older hard ones.

In practice single ploughing and harrowing operations do not bring all the tubers to the surface, and consequently the desiccation of tubers on the dry, ploughed land will be further retarded, since the humidity of the soil air is higher than that of the atmosphere.

In normal years no rain, or only small precipitations are recorded between the months May—September in the summer rainfall area. The moisture content of the soil in the upper 12 inches falls so low, that uprooted nut-grass tubers desiccate to such an extent as to entail a high mortality. On 1 July 1941 (winter) readings on nut-grass infested soil at the Experiment Farm indicated a moisture content of only 5·32 per cent. in the upper 6 inches of soil and of 9·66 per cent. on the layer of 9 to 12 inches deep.

At this stage the experimental work was started. Plots were cultivated at three various depths, viz. 6 in., 9 in. and 12 in. In applying the 12 in. method an attempt was made to sever all the tubers from their deep-root system. After this cultivation the plots were not touched again, and very few tubers were actually brought to the ground surface. Further readings were regularly taken.

On 20 November, after the planting season had commenced, only two nut grass plants appeared above the ground of the plot which had been cultivated to a depth of 12 in. and investigation showed that these plants had developed from tubers near to the 12-in. level. On the 6-in. level cultivation plot, infestation was severe, and although it was less severe on the 9 in. plot it was clear that these weeds could not be controlled effectively by such cultivation. On 23 January—after good rains—a few more nut grass plants appeared on the 12 in. level cultivation plot, and these too had their origin from tubers near to the 12-in. level. The great mass of tubers within the first 9 in., however, were completely dry and dead.

Conclusions.

The result of this experiment showed that the weeds were not completely eradicated, but that deep cultivation serves as a successful control measure.

In practice this desiccation process may be assisted by using, after a few weeks, a heavy cultivator on deeply cultivated soil. In this way the clods will be broken up and more tubers brought to the surface. The cultivation operations should be so timed that the first cultivation takes place in mid-winter when the soil is quite dry, and when two or more dry months will follow the cultivation, in order to ensure desiccation of the tubers. Naturally, untimely rains—like those which fell last season—will upset the control process.

Another advantage of the deep cultivation method is that the first nut grass plants appear on the surface late during the growing season. This is due to the fact that a period of one month elapses before a rhizome of a tuber lying 12 in. deep can force its way to the surface to form a plant. By this time the young crop plants have become strong enough to withstand the little competition of isolated nut grass plants. Where similar control is not applied the nut grass breaks through in large numbers either simultaneously with or before the crop, and if hoeing is not immediately resorted to, the crop is doomed to failure.

In our summer-rainfall area winter ploughing is generally practised, and the prescribed measures, therefore, do not entail re-distribution of the ordinary labour, or the lying fallow of land for a season or longer. The control method recommended by Smith and Mayton(7) of the U.S.A. is based on the regular breaking up of

infested soil at intervals of three weeks or less for two seasons. This procedure exacts much time and entails the lying fallow of land for two seasons with a consequent loss of production.

The most serious practical objection to the method recommended is, that some soils become so hard in winter, that it is almost impossible for the farmer who has only inferior implements and inadequate traction at his disposal, to apply deep cultivation.

Where adequate mechanical traction and strong implements are available, however, this difficulty should not be insuperable. Any implement which will penetrate to the desired depth and effect a relatively complete cut, will serve the purpose.

Finally the writer wishes to give a few conclusions drawn from other experimental methods for the control of nut-grass:

The effect of five weed eradication chemicals, viz. Sodium chloride, ammonium sulpho cyanide, sodium arsenate, sulphuric acid and "Eradiweed" were put to the test. The latter is a weed eradicator offered by the trade. It was found that two sprayings with a 30 per cent. concentration of sodium chloride solution will destroy nut grass. The results of other chemicals were negative. This method is, however, very expensive and cannot be recommended for application on large infested areas.

Many farmers are of the opinion that *nut grass* can be controlled by a smother crop, and consequently the smothering effect of sunn hemp, oats, Italian rye grass, teff, and a creeping grass *Paspalum distichon* were tested out. These plants, however, all gave absolutely negative results. In those cases where a smother crop did prove a success yellow nut grass apparently was troublesome. Normally the smother crop is sown about the end of December or in January, i.e. during the critical period in the life of yellow nut grass, when ploughing and harrowing destroy this weed on a large scale. Consequently the success obtained was not due to the smother crop but to the cultivation of the soil during the critical period in the life cycle of the plant. A smother crop like sunn hemp will, however, assist in drying the soil before the deep winter cultivation follows. If a land is so heavily infested that no crops can be raised during the summer, a smother crop, sown fairly late in the summer is recommended.

In view of the exhausted effect of the tuber system of nut grass a cultivation experiment was undertaken by which the plants were cut off at the surface every sixth day. This process coincided with the unfolding of the leaves. After 50 days new plants still appeared at the same rate. It is clear, therefore, that this method is quite impracticable, since it entails too much time and labour.

Summary.

(1) There are two uintjie species which play an important rôle as weeds, and with a view to applying control measures it is necessary to differentiate between them.

(2) Yellow nut grass may be successfully controlled by ploughing and harrowing during the flowering period, when the plants themselves undergo a critical stage.

(3) The opinion has been advanced that the propagation of nut-grass (uintjieskweek) from seed is a factor which practically does not count and that when once these plants have established themselves, the tubers are the main source of infestation.

(4) The tuber system of nut grass may be divided into the active surface and the deeper dormant system, which normally is not destroyed by ordinary ploughing and which throughout the winter is fed by a very deep root system.

(5) An effective control method must aim at the complete eradication of both systems, but especially the deep system which spreads the infestation even after the surface system has been destroyed.

(6) Nut grass tubers desiccate under the following conditions:—

(*a*) The tubers must be severed from their root system.

(*b*) The soil moisture within the area in which the tubers are found must preferably be below wilting point.

(*c*) The humidity of the atmospheric and soil air must be very low.

(7) Deep cultivation by which the tubers are severed from their root system and subjected to desiccation on the dry ploughed soil, is recommended as a control measure. The depth of cultivation will depend on the distribution of the tubers, and the time for cultivation will be approximately mid-winter, so that in order to ensure desiccation two or three dry months will follow on cultivation.

(8) Two sprayings with a 30 per cent. concentration solution of sodium chloride will destroy nut grass, but this method is too expensive for use over a large area.

(9) The use of smother crops to eradicate nut grass yielded negative results, but indirectly it had the desired effect of assisting in the drying of the soil for deep winter cultivation.

(10) The control of this weed by repeated hoeing of the surface plants entails too much time and labour, and after 50 days new plants still appeared at the same rate.

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Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

The Draught Horse.

Dr. L. L. Roux, and H. J. v. d. Merwe, College of Agriculture, Grootfontein, Middelburg, C.P.

IV(a). Feed Requirements.

IN addition to the advice contained in the May 1943 issue of this journal on the subject of feeds and feeding, the following should serve as a useful guide.

In this country, and especially where the climate is mild, all horses should spend as much as possible of the day and night out of doors and, whenever possible, on pasture. They should, if possible, receive most of their supplementary rations on pasture.

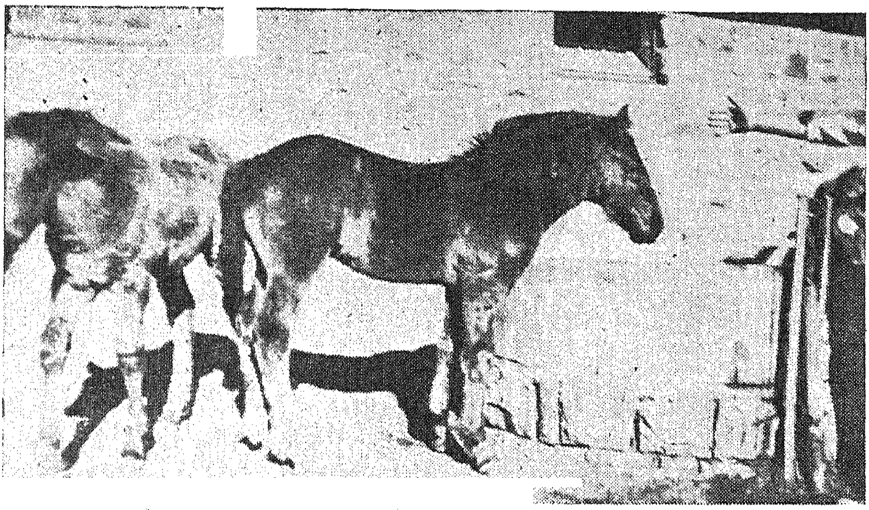


Fig. 1.—" Glen Jix " at the age of 3 months already displays fine qualities.

When it is necessary to feed large amounts of roughage, they should be fed only during periods of rest. Two-thirds of the hay should be fed at night and the rest mainly in the morning, leaving only a small amount for the noon feed.

The grain ration should be fed in two equal portions.

Although no definite standards can be laid down with regard to feed requirements of horses of different ages or classes, because of the great individual variability that will always exist, general rules will assist in gauging the requirements. The following are the approximate amounts of concentrate and hay required by work horses *per* 100 *lb. body weight* per day:

Hard work.—1 lb. concentrates and 1 lb. hay.

Medium work.—0·75 lb. concentrates and 1·0 to 1·25 lb. hay.

Light work.—0·4 lb. concentrates and 1·25 to 1·5 lb. hay.

The importance of keeping horses in good but not over fat condition must be stressed. Most horsemen firmly believe in the Arab saying: " Rest and fat are the greatest enemies of the horse ".

A horse that is a hard keeper will need considerably more grain than any easy keeper when doing the same amount of work. Young horses that are still growing, mares that are pregnant, and mares suckling foals, will need more grain than other work horses.

The following rations are recommended by the Bureau of Animal Industry, United States of America.

Daily Rations for 1,000 lb. horse at medium work.

(1)	Oats	11	(4)	Barley, rolled	10
	Timothy hay	6		Lucerne hay	6
	Clover or lucerne hay	6		Prairie or Timothy hay	5
(2)	Oats	6	(5)	Maize (shelled)	11
	Maize (shelled)	5		Cowpea hay	6
	Timothy hay	6		Johnson grass hay or maize stover	6
	Lucerne hay or Clover hay	6	(6)	Maize (shelled)	10
(3)	Maize (shelled)	8		Soybeans or cowpeas	1
	Bran, wheat	2		Lucerne hay	6
	Lucerne hay	8		Maize stover	6
	Timothy hay	4			

(The Timothy hay in the above table may be replaced by any of the grass hays produced in this country.)

The amount of feed should vary, not only from winter to summer, but also from day to day, that is, if the degree of work is materially altered, or if the horses are idle for a day or more. A mash consisting of 3 to 4 lb. bran per horse mixed with hot water is often given on idle days such as Sundays.

The condition of idle horses may be maintained satisfactorily on stalk or stubble lands or veld that has not been grazed too closely. However, it is thought that it will be found necessary in most cases to feed small quantities of legume hay (lucerne, cowpea, or soybean). Silage, if used, should not exceed 10 lb. per head per day.

If legume hays are not available, a small quantity of grain can be substituted, especially if the horses are pregnant mares. In such cases, oats is best, but maize and barley can also be used and the ration would be improved appreciably by including one of the oil meals.

It is important that work horses should be properly conditioned for spring work. The horses require extra feed for several weeks before the work begins. The exact amount of feed and the period of preparation will depend upon the condition in which the horses have come through the winter.

The pregnant mare should receive the management outlined for the working horse, except that she should be given rations slightly higher in protein and minerals which should be increased as gestation advances. Hence, if the mare is idle in winter, most of the feed may consist of *good* roughage, but hay and grain must be fed if work is performed.

Watering Horses.

Horses should be given water at regular hours. Mature horses drink about 10 to 12 gallons a day. Horses should be watered moderately after work and before being fed. A horse should not be allowed to drink his fill when warm as a result of work, nor should

it be watered heavily before being put to hard work. When at hard work during warm spells, attempts should be made to water moderately every hour.

IV(b). The Rearing of Foals.

Foals should be encouraged to eat grain as early as possible in life; if their dam's feed is placed in a box on the ground they will start nibbling at the age of 3 to 4 weeks.

Crushed or rolled oats and wheaten bran are the best concentrates for foals. As they get older other feeds such as maize and the protein-rich concentrates may be added to their rations. Lucerne and

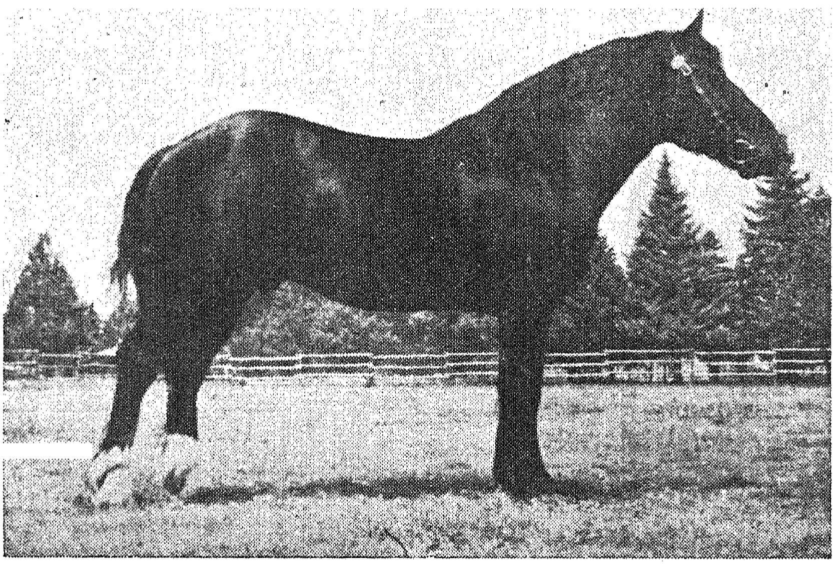


Fig. 2.—"Glen Jix" at the age of 2 years and 3 months as winner of Administrator's trophy.

Photos by Dr. P. J. v.d. H. Schreuder.

other legume hays are good, but mixed hays (legumes and good grass) are best. The attendant should make sure that the hay, when placed in the racks for the mares, is accessible to the foals.

At the age of 2 months, foals will take oats, maize meal and wheaten bran in the proportion 3:2:1. In order to make sure that the foals are getting their share, some sort of a foal-creep could be constructed in the stall or on the pasture. A creep is an enclosure, the gate of which is made so as to keep the mares out but to allow the foals to enter. The foals can be started on a handful of crushed oats, or oats and bran, which can be increased according to appetite and depending upon what nourishment it is getting from the pasture. At weaning time, the supplementary ration may be between 1 and 2 or even 2½ lb. per head per day.

It is imperative that the growth of the foals should not be inhibited, consequently they should receive sufficient quantities of

feed, and, most important, feed containing adequate quantities of protein, calcium and phosphorus. When the types of feeds recommended above are fed to foals, there will be little danger of the protein and phosphorus requirements not being supplied. In order to supply the calcium requirements, one half to one ounce per head per day of calcium carbonate should be fed. When foals are on excellent pasture and are fed only very small quantities of supplementary grain, they are likely to require phosphorus in which case ½ to 1 oz. of a mixture of equal quantities of calcium carbonate and calcium phosphate can be fed. Plenty of outdoor exercise on pasture will ensure a sufficiency of vitamin D which will prevent rickets. Foals with rickets should be given 1 oz. of cod-liver oil per day, adequate quantities of lucerne hay and outdoor exercise. The best pasture for foals is a mixture of legumes and grass.

The Weaned Foal.

Foals may be weaned at the age of 5, 6 or 7 months. If they have been given grain before weaning, they experience no marked hardship and setback at weaning. Whenever possible provision should be made for pasture or adequate supplies of good quality legumes and grass hays.

It is important to ensure the normal "drying up" of the mare's udder, especially in the case of good milkers. If the mares have been receiving grain, this part of the ration should be reduced for a few days before the foals are taken away. After weaning, the udder should be watched and milked out when necessary, but the milkings must not be too frequent or too complete or the mares will not dry up.

A thrifty well-fed foal should make approximately half its entire growth during its first year. If stunted during this period, foals rarely reach full size, and in draught foals size is of great importance.

The following feed combinations have been recommended for weaned foals ; they are to be fed in conjunction with lucerne hay, supplemented with good quality grass hays:—

(1) Oats.

(2) ½ Oats and ½ maize.

(3) ½ Oats and ½ barley.

(4) 3 parts weight oats and 1 part wheaten bran.

(5) 3 parts weight maize and 1 part wheaten bran.

(6) 2 parts weight maize, 2 parts oats and 1 part wheaten bran.

Better results are obtained when more oats is fed than maize.

Silage can be fed to foals with advantage. It was found in America that feed costs of draught foals were reduced by replacing ¼ of the concentrate and hay rations by maize silage; 22 lb. of silage and non-leguminous hay were fed in conjunction with 8·4 lb. of oats and 2·1 lb. of bran.

The appetites should be a guide as to their requirements which will be found to approximate ¾ to 1 lb. grain and 1 lb. roughage per 100 lb. body weight.

According to Crompton, quoted by Morrison, the following are average weights of draught type foals at various ages. The study

involved 409 draught foals out of mares and by stallions averaging 1,760 and 2,050 lb. respectively.

Birth weight	120 lb.
6 months	730 lb.
12 months	1,020 lb.
18 months	1,350 lb.
24 months	1,480 lb.
36 months	1,790 lb.
48 months	1,980 lb.

Stallions usually weigh somewhat more than mares.

Feeding Orphan Foals.

H. H. Reese, Bureau of Animal Industry, U.S.A., gives the following information upon the subject of rearing orphan foals. "Raising a foal by hand is not a job for the careless and indifferent. It requires patience, painstaking care, perseverance, judgment and cleanliness. Unclean receptacles for the milk and irregular intervals for feeding will probably cause scours. The quarters should be kept very clean and the orphan foal should have company of some kind. Another foal is desirable, but even a calf is better than no company. A grassy paddock with abundant shade, fresh water, and protection from flies, increase the orphan's chance of proper development.

"Cow's milk furnishes a most logical substitute for mare's milk but, as the composition is somewhat different, certain changes or modifications are necessary in order that the supplied diet be not too dissimilar to the natural."

The following table gives the average composition of the two kinds of milk:—

Composition of Milk from Cows and Mares.

Source.	Water.	Protein.	Fat.	Sugar.	Ash.
	%	%	%	%	%
Cow........................	87·17	3·55	3·69	4·88	0·71
Mare......................	90·78	1·99	1·21	5·67	0·35

Milk which is not rich in butterfat, preferably from a recently freshened cow, should be diluted about half with fresh water. A tablespoonful of sugar and about 3 tablespoonfuls of lime water should be added for each pint. This mixture should be supplied to the colt at about body temperature . . . At first about half a cup of milk should be given every hour, the quantity being increased slightly and the intervals lengthened gradually as the foal grows older. In about two months skim milk may be substituted for whole milk and in addition one of the following rations should be fed: 1 part flax seed meal boiled to a jelly and 2 or 3 parts wheaten bran; or two parts ground oats, 1 part maize meal and ½ part flax seed meal; or two parts bran, 2 parts maize meal and 1 part linseed meal. Feed a double handful at first and increase gradually.

At first a nipple with a fair-sized hole in it can be used, but the foal should be taught to drink from a bucket as soon as possible. It

will then also be easier to teach it to eat meal from a bucket. Particular care should be taken to keep the nipple and the bucket thoroughly clean.

Parasites.

Young horses will respond much better to good care and management if they are kept free from parasites. It is advisable to consult a veterinary surgeon with regard to the most effective doses for gastric and intestinal worms.

If necessary, horses may be put through the cattle dip to keep them free from ticks, and they should be handdressed with tick oil. It is obviously dangerous to put pregnant mares through a dip.

Handling of Foals.

While foals should spend as much as possible of the day and night outside, they should not be allowed to run wild. A reasonable amount of handling whenever convenient will help a great deal in making the training of foals a relatively easy task.

If shelter afforded by windbreaks is considered insufficient a semi-open shed should be ample for the most severe conditions of cold in this country. The shed should be placed so as to exclude the prevailing cold winds.

It will be found that somewhat overgrown and awkward foals require much fitting and training.

Horsemen of experience contend that monthly attention will ensure normal development by preventing the growth of crooked feet and legs. During the first few months, nothing can usually be done, but when the foal is 3 months old, trimming with the hoof knife can begin. The toe or heel may be too long. If foals have plenty of exercise on hard ground, the feet will wear gradually, but when foals are stabled, it may be necessary to rasp down their feet every few weeks and the soles and clefts should be picked out every few days.

It is considered a good plan to break foals to lead before they are weaned and to harness between the ages of 2 to 3 years.

Colts intended for work animals should be castrated at the age of 1 to 2 years.

Telling the Age of a Horse.

The approximate age of a horse can be told by observing the following:—

At $2\frac{1}{2}$ to $2\frac{3}{4}$ years the middle pair of temporary incisors above and below are replaced by permanent teeth.

At $3\frac{1}{2}$ to $3\frac{3}{4}$ years the second pairs of temporary teeth are replaced, and this is completed at 4 years.

At $4\frac{1}{2}$ to $4\frac{3}{4}$ years all the incisor teeth, 3 pairs top and bottom, six pairs in all, are permanent, although the corner incisors have generally not yet come into wear.

At 6 years the "cups" in the central incisors are almost obliterated by the wearing down of the teeth.

At 7 years the "cups" show plainly only in the outside pair of incisors in the lower jaw.

At 8 years the "cups" are worn out of all the lower teeth.

Stables.

The type and the size of stable will depend a great deal upon the nature of the horse enterprise or section and the number of horses kept.

Stud or registered stock will, of course, require more attention and better facilities.

Generally, it is contended that horses should spend as much as possible of the day and night outside.

It is not intended to describe the lay-out of any system of stabling, but merely to mention a few points of interest which may be of value to the less experienced.

The requirements of a horse stable are to provide a dry, comfortable, hygienic shelter, free from draughts, yet capable of being thoroughly ventilated. A north-facing stable is preferred. A good-sized single stall for a horse weighing about 1,500 lb. is 5 ft. by 10 ft. Loose boxes have, of course, many advantages over stalls. These boxes may be 12 ft. by 10 ft. by 10 ft., but others recommend 12 ft. by 12 ft. by 10 ft., while a 16 ft. by 16 ft. loose box is recommended for foaling boxes. A cement floor properly grooved is as good as any other type, provided an abundance of bedding is available. Rammed clay or "ouklip" is preferred by many. The latter types require constant repairing as they must be kept smooth. Wet, mucky floors result in serious foot troubles.

The loose box should have a 4-ft. wide double door, the top section being 3 ft. 6 in. and the low portion 4 ft. 6 in. high. Both doors should be capable of being hooked back to prevent them from shutting when a horse is being led out. A suitable sized window should be placed high up in the same wall as the door. The window should open inwards on hinges at the lower edge.

The stable should contain a trough for grain and a rack for hay, both of which should be placed at a convenient height for a mature horse.

Semi-open shelters afford excellent shade and shelter for idle horses on veld. Bags hung from the rafters enable the horses to brush off the flies.

Grooming.

Horses that are pastured, or are out of doors, do not require much grooming; there is little perspiration, most waste products being thrown off through the bowels and kidneys. On the other hand, horses doing hard work and kept on a high feeding level require regular and thorough grooming.

It is considered best to groom work horses well at night to enable the animals to get a good rest and then to give a good brushing in the morning.

A thorough grooming of a horse should take from 45 to 60 minutes.

The body brush is used for the main part of the grooming, that is, for the removal of dirt and scurf and for massaging. *The curry comb should not be used direct on the body, but only to clean the body brush.*

The dandy brush is intended only for the legs, mane and tail. It is also useful for removing caked dirt or mud from the body and for cleaning rough-coated horses.

The water brush has longer and finer bristles than the body brush. It is used wet for washing the feet and damping the tail and mane. The heels of a horse should always be dried after washing to prevent cracked heels to which horses are very susceptible. A sponge, stable rubber, and flannel rag are often kept for the washing and wiping of the eyes, nostrils, etc.

Care of the Horse's Feet.

The information given below upon care of the feet and shoeing has been abstracted from details kindly made available by Dr. Quinlan, Assistant Director of Veterinary Services, Onderstepoort.

Proper shoeing does no harm to the horse's foot.

In most parts of the Union, the ground is too hard and stony for the unshod feet of working horses, and this is especially true during the long dry seasons of the year. Deformities such as "turned in" or "turned out" toe can be corrected by careful shoeing.

The following rules form the basis of proper shoeing:—

(*a*) Aim at creating a proportionate foot. This advice, however, cannot be followed indiscriminately, as consideration must be given to the various forms of feet which deviate from what is considered a normal foot.

(*b*) The shoe should be fitted accurately to the outline of the bearing surface. The wall should not be rasped away so as to fit a shoe which has been made too small. The whole bearing surface should be used: it should not be reduced in width by rasping.

(*c*) The perioplic varnish should not be removed from the surface of the wall with the rasp. It is there for the special purpose of preventing absorption and should not be rasped off. Continuous removal of this "varnish" will eventually cause dryness and brittleness of the horn, and ruin the foot.

(*d*) The sole should not be touched with the knife. The superfluous horn is cast off as a natural process. Paring the sole renders it more liable to bruises and has the same effect as rasping of the wall; neither should the bars be weakened by paring, for they act as a wonderful support for the heel of a properly fitted shoe.

(*e*) The frog may be trimmed of scraggy, loose portions, but should not be reduced in size. It should come into contact with the ground or as close to it as possible.

(*f*) The shoe should have a level bearing and ground surface so that it is applied to the bearing surface of the wall and the bars. A narrow shoe gives too much pressure on the outer border of the wall, and too wide a bearing surface presses on the sole.

It is unwise to use too many nails to attach a shoe, as each nail damages the horn. At the same time a shoe must be nailed securely so that it cannot be easily torn off. The nails should not be driven too high into the wall. Clips should not be applied too deeply, either in the region of the toe or quarters, as they are damaging to the wall. A too closely applied clip, in conjunction with dryness and brittleness of the horn, frequently causes "seedy-toe".

A dressing consisting of 1 part of Stockholmtar and 10 parts of fish oil will help to keep the feet in good condition.

New Bulletins for the Farmer.

The following Bulletins have just been published and are obtainable from The Editor, Department of Agriculture and Forestry, Pretoria.

Bulletin No. 192.—"Control of Household Insects in S.A." (2nd Edition): Price 6d.

Bulletin No. 111.—"Dairy Farming" (Fifth Edition): Price 6d.

Bulletin No. 126—"Poultry Houses": Price 3d.

Olive Culture in South Africa.

E. F. Malan, Horticulturist, College of Agriculture, Potchefstroom.

AS a branch of agriculture, olive culture still plays a fairly insignificant rôle in South Africa, as compared with the Mediterranean countries, such as Italy, Spain, Greece, Portugal, Tunisia, Algeria, etc. Since 1939 there has been a considerable rise in the price of olives, and statistics reveal that there is a definite annual increase in the use of the olive and its products.

The olive is a beautiful evergreen with small, lanceolate, leathery leaves, and bears numerous small fragrant blossoms and round or oval stonefruits which are blue or black when ripe. The tree reaches a height of 40 feet, and may attain an age exceeding one hundred years.

Climatic and Soil Requirements.

Ample proof of the suitability of our climate for olive culture is the presence of great numbers of wild olives in various parts of South Africa, in the coastal belt as well as in the interior, and especially in Griqualand West and the northern and south-western Transvaal. This wild olive (*Olea verucosa*) not only provides a hard servicable wood but also serves as the rootstock for our European or cultivated varieties. The fruit, however, has no economic value owing to its low oil content.

The cultivated olive is also a hardy tree when budded on the wild rootstock, although perhaps not quite as hardy as the wild variety. During the first year of growth the tree can withstand from 10 to 12 degrees of frost, whereas a three- or four-year-old tree can resist a considerably lower temperature.

In order to test out olive trees under climatic conditions prevailing in the western Transvaal and the Transvaal highveld, 12 trees of each of the pickling and oil-producing varieties were planted at the Potchefstroom College of Agriculture and Experiment Station in September, 1936, the varieties chosen being *Ascolano*, *Manzanillo*, *Mission*, *Sevillano* (Cf. *Spanish Queen* or *Queen*), *Spanish Queen*, *Leccino*, *Pyramidalis* and *Late Blanquette*. Immediately after planting, all the trees were cut back to height of 18 ins. above the ground. The majority of the varieties grew as much as 24 inches during the first summer. Unfortunately, the winter of 1937 (i.e. the first winter after planting) was exceptionally severe, and all the trees died right down to below the bud. The lowest temperature recorded during June in the sheltered orchards was 16° F. below freezing point, whilst varying degrees of frost were experienced during the 21 nights. During July the temperature dropped below freezing point on 22 nights, and on five occasions more than 10 degrees of frost were registered.

Under similar circumstances older trees would probably have suffered less damage, and it would appear that the success of establishing an olive orchard in the cold inland areas will largely depend on the severity of the first winter which the trees must endure.

In this area, however, there is a danger that the fruit as such might be damaged by low temperatures before it is harvested in April or May. This danger can be largely eliminated by harvesting the fruit earlier for making green pickles.

In so far as soil is concerned, the olive is not very particular and thrives on sandy, loam or sandy loam soils. Slopes and ridges of sandstone or weathered granite are particularly suitable sites for

planting olive trees. The olive tree usually does well where many of our other fruit trees might be a failure, but it prefers a gravelly soil which is rich in lime or potash. Although the olive tree cannot tolerate standing water in the region of its root system, the writer has actually seen trees doing well under irrigation on alluvial soil along the Orange River. At present the olive tree is being tested out at the various irrigation schemes, such as Vaal Hartz, Pongola, Buchuberg and others.

Irrigation is not always essential in areas with a low rainfall, because by planting the trees farther apart olives can still be grown successfully in areas with an annual rainfall of from 5 to 10 inches.

Varieties.

Olives are grown mainly for the production of olive oil and to a lesser extent for pickling, either green or ripe. Some varieties are suitable for both purposes, while others are used either for oil only or for pickling only.

Among the 15 or more varieties found in the Union to-day, the following might be mentioned:—

1. For the production of oil: Mission, Leccino, Lucca and Old Cape.
2. For pickling: Sevillano (also known as Queen or Spanish Queen), Manzanillo, Ascolano and Mission.

As there is an increased demand for oil, it is advisable to confine new orchards to the oil-producing varieties, or otherwise to plant varieties which will serve both purposes.

Planting Young Trees.—The spacing is usually determined by the rainfall but is seldom less than 28 or 30 feet square. In certain parts of North Africa and along the east coast of Greece where the annual rainfall is only a few inches, planting distances of more than 60 feet are not exceptional. The interplanting or quincunx system, in which a fifth tree is planted temporarily in the middle of the square formed by 4 trees, is a desirable practice if the soil is suitable for such temporary trees.

The time for planting will largely depend on the rainy season, June to August being a suitable period in the winter-rainfall areas. In the summer-rainfall areas October to March will be more suitable, especially where irrigation is not practicable.

On soils deficient in lime it is advisable before staking out the positions of the trees to plough in one or two tons of agricultural lime per morgen. After the positions have been staked out, the holes are dug and a bushel basket of well-rotted manure or compost is mixed with the soil in each hole. After the trees have been planted, they should be cut back to knee-height and immediately irrigated or watered.

Pruning.—This is an important operation which is often neglected. After a year or two, three to six scaffold branches are selected and the other shoots removed. Further pruning until the tree reaches the bearing stage consists mainly in thinning out superfluous twigs. Regular annual pruning is essential for bearing trees as fruits are borne only on the previous season's growth. Regular light pruning promotes the formation of sufficient new growth for the following year's crop. Trees which have not been pruned show a tendency to produce a crop every other year or every third year only.

Varieties like Mission, which are inclined to grow very erect, require more attention at pruning time than spreading varieties.

Upright-growing trees frequently become too dense on the inside, and regular thinning out of the twigs will prevent the formation of dry wood.

Propagation.—As has already been mentioned the wild olive is used as rootstock for the cultivated olive. The young trees on which the desired variety is to be budded are raised from seed or thick-hard-wood cuttings. In some countries a variety is propagated on its own roots by using hard-wood cuttings about one inch in diameter. In certain parts of Asia Minor full yields are obtained after five or six years by planting olive stumps 6 feet in length and at least four inches in diameter, while with our nursery methods of cultivation it takes fully three years to obtain a tree only strong enough for transplanting.

Yield and Economic Importance.

The trees usually start bearing from the sixth or seventh year and, when about ten years old, ought to yield a crop of from 5 to 10 tons of olives per morgen. The yield will gradually increase until the trees have reached the age of 20 years or more. Depending on the variety, the oil content of the fruit and the method of expressing used, one ton of olives will yield from 5 to 20 gallons of oil.

Statistics reveal that the consumption of olive oil in South Africa is increasing every year and that our internal production and plantings are progressing very slowly. The present consumption of olive oil in the Union amounts to approximately 65,000 gallons per annum. Owing to the fact that the oil is offered on the world market at comparatively low prices by the producing countries round the Mediterranean, we can hardly hold out the prospect of any export trade in this product. Olive growers are therefore warned that it might be economically unsound to produce quantities in excess of the local demand.

It is therefore recommended that only soils which are unsuitable for the cultivation of most other crops should be used for planting olive trees, and that the systematic top-working of the thousands of wild olive trees in the Union should receive more attention. The latter process of improvement is comparatively easy under the climatic conditions prevailing in the moist coastal areas where the grafting of wild trees and budding on to the young shoots which sprout from the stem after the tree has been cut, have already been applied with success.

In the drier parts of the interior grafting of old trees is not always successful and the budding of young shoots during the rainy season offers greater possibilities. Efforts have been made by the writer to top-work the wild olive trees in the Barkly West district where budding proved more successful than grafting.

The method of grafting employed embraces several modifications of the bark or crown-graft and in certain cases the cuttings were covered with cow-dung and clay right up to the tips in order to reduce desiccation. Better results were obtained by budding on to the young shoots which appear during summer as a result of the cutting down of the tree in winter.

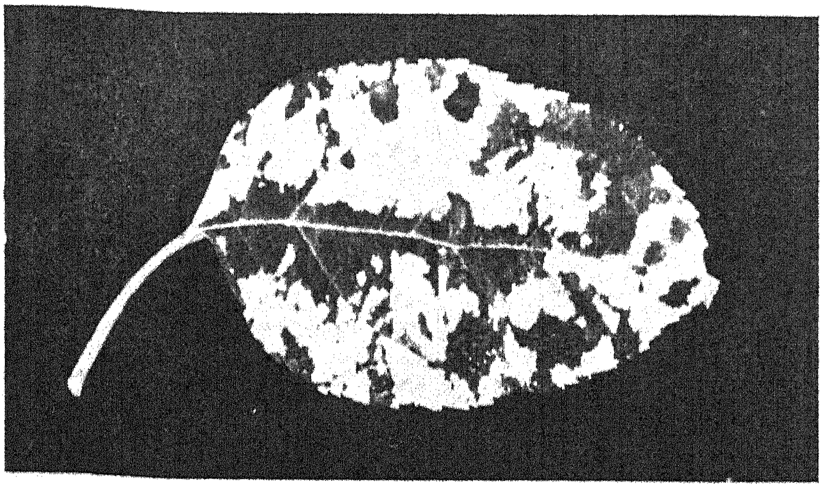
When the trees are sawn off at a height of about four feet above the ground, bark and cleft grafting should prove more successful in the moister areas of the Transvaal. In cases where it is impracticable to protect the grafts against animals, the trees can be sawn off at a height of six feet so that the grafts will be out of the reach of animals.

In the Western Cape Province there is a properly equipped oil-extraction plant which offers a steady outlet for South African olives.

Mottle Leaf or Mosaic Chlorosis of Apples.

A. J. Louw, Western Province Fruit Research Institute, Stellenbosch.

FOR many years apple trees in South Africa have been subject to a mottle leaf or mosaic type of chlorosis, and judging by the number of enquiries received from fruit-farmers in the winter rainfall area, it appears that this manifestation is growing in extent. During a preliminary survey of the incidence of mottle-leaf chlorosis in Ceres and Elgin, no apple orchard was found that was entirely free from



Apple Leaf affected with Mosaic.

the disease. The Golden Delicious variety, in particular, appeared to be severely affected, for in all the orchards of this variety that were examined almost 100 per cent. of the trees were affected.

Symptoms.

The typical symptoms of mottle leaf chlorosis are the numerous white or yellow blotches on the leaves (see illustration). In the spring and early summer while tree growth is still very active, the leaf blotches are white in colour, while leaves developing in late summer very often show yellow blotches. Sometimes the major portion of the leaf is white in colour with only a narrow band of green adjoining the larger veins, while in other cases again, the chlorosis occurs only along the larger veins, the rest of the leaf retaining the normal green colour. Leaves have also been noticed where only the serrated border is chlorotic. During the summer months of intense sunlight and desiccating winds, the chlorotic blotches have a tendency to dry out, followed by shedding of the leaves. In this manner severely affected trees may sometimes become almost entirely defoliated in mid-summer. All the leaves on a shoot may show the chlorotic blotches, but usually normal leaves occur among affected leaves on the same shoot. The fruit of affected trees show no symptoms of the disease.

Cause.

It is well-known that nutrient deficiencies may cause certain types of chlorosis on leaves of plants. Zinc deficiencies (Little Leaf disease) and manganese deficiencies are, for instance, both accompanied by certain chlorotic symptoms on the leaves. In these cases the leaves again develop their normal green colour when the deficient nutrients are made available. In recent tests, carried out at Stellenbosch, it was, however, demonstrated that the mottle leaf or mosaic type of chlorisis is not associated with minor element deficiencies, but is a contagious disease belonging to the group known as virus diseases.

A virus disease is caused by a specific infectious principle or virus occurring in the sap of affected plants, the virus itself being invisible, even under a microscope. Virus diseases may be transmitted to healthy plants by contact with the sap of diseased plants or by certain insects carrying the infectious principle from diseased to healthy plants. Certain virus diseases are only transmitted by grafting or budding infected material on healthy plants. This is usually the case with virus diseases of woody plants, such as fruit trees.

Mosaic chlorosis of apple is readily transmitted by grafting or budding infected material on to healthy trees. Attempts to transmit the disease to healthy trees by means of the sap of affected plants were unsuccessful, and it appears unlikely that the disease is transmitted from tree to tree by pruning. Whether the infectious principle can also be transmitted through the agency of insects has not been investigated, but the indications are that in the field budding and grafting are mainly responsible for its spreading. When healthy trees are grafted or budded with infected material, the typical mosaic leaves develop on the rootstock even though the infected bud may not be allowed to run out. The disease is also transmitted by buds from the axils of apparently healthy leaves taken from mosaic infected trees, as well as by grafting bark strips from affected trees on to healthy trees. The infectious principle thus not only occur in the buds situated in the axils of mosaic leaves, but is present in the entire bark of infected shoots even though such shoots may bear only a few mosaic leaves.

When trees are inoculated with the mosaic virus, the first mosaic leaves always develop in the vicinity of the bud with which the infection is made. If the infected bud is inserted in the autumn, the first mosaic symptoms usually do not appear until the following spring. The initial movement of the virus is apparently mainly downwards to the roots, for the mosaic symptoms first appear on shoots and leaves below the site of inoculation and on shoots arising from the roots, before making their appearance in the tree top.

The rate of movement of the virus in the tree is influenced by the vigour of the tree, for, if after insertion of the infected bud the growth of the tree is forced by pruning, the mosaic symptoms develop in the current season, while the infected bud is still dormant. In poorly growing trees the virus may remain localised for several seasons in particular limbs of the tree, spreading only at a very slow rate. On the other hand, distribution of the virus is very rapid in vigorously growing trees. Instances are known where the virus has spread through the entire tree two years after inoculation with a single infected bud on one of the terminal shoots.

Varietal Susceptibility.—It is doubtful whether any of the commercial apple varieties are immune to mosaic. The disease was artificially transmitted to the following varieties: Apple of Com-

merce, Cleopatra, Golden Delicious, Granny Smith, Oheuimuri, Red Delicious, Rokewood, Rome Beauty, Versveld and White Winter Pearmain. Preliminary observations seem to indicate that the virus is spreading more rapidly in the varieties Golden Delicious, Oheuimuri and White Winter Pearmain.

Damage Caused by the Disease.

When leaves have lost their normal green colour as a result of infection with the mosaic virus, they obviously cannot properly fulfil their functions. When the greater part of the foliage of trees are affected with mosaic chlorosis and, as usually happens, the leaves are shed prematurely, it may be expected that growth and production of such trees will compare unfavourably with that of normal trees.

No experimental data is available to show the amount of damage to trees and the crop decrease caused by apple mosaic. On account of its widespread occurrence it is very difficult to obtain reliable data in the field that will demonstrate its effect on tree growth and yield. In old orchards, however, severely affected trees are very often low in vigour and produce small crops of inferior quality fruit. It is only in such orchards, where the trees have been infected with the virus for many years, that the harmful effect is noticeable; in young orchards the deleterious effect of the disease is not very apparent. For the present, however, the damage that it may cause and the fact that it is a virus disease is sufficient reason for taking measures to prevent the further spreading of apple mosaic.

Counter Measures.

Apple mosaic is of such general occurrence in most apple orchards that any attempt to eradicate the disease by destroying affected trees is unpractical at present. If, however, only trees free from mosaic are used for all new plantings, the disease will ultimately be eliminated to such an extent that more drastic measures may subsequently be applied for its eradication.

The success of such a procedure would depend on the precision with which nurserymen henceforth select their bud and graft wood from mosaic-free trees. As indicated, the entire tree may be a potential source of infection, even though it might bear only a few mosaic leaves. On no account must budwood and scions be taken from affected trees because the virus may have spread beyond the limits indicated by the external symptoms of the disease. Nurseries practising rootgrafting should take the same precautions in selecting rootgrafts for, as shown above, the virus may also be present in the root system of affected trees.

Fruitgrowers will have to take similar precautionary measures where mature trees are topworked in the orchard. The spread of the virus in the tree is particularly rapid in such cases, because the drastic pruning incident to top-working stimulates the tree to increased growth activity, which, as indicated above, favours the movement of the virus in the plant. Where stubgrafting is applied, large numbers of grafts are inserted over the entire framework of the tree and the opportunities for infection with the virus is considerably increased. If growers intend buying trees for new plantings, it is advisable for them to inspect the nursery during the summer months when the trees are still in full leaf, for only at this time can they make sure that the trees to be planted are free from mosaic.

Summary.

1. The mottle leaf or mosaic type of chlorosis prevalent an apple trees in South Africa, is infectious and is caused by a virus.

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Soil-Erosion Works and Farming Systems.

J. W. Cleghorne, Senior Soil-Erosion Engineer, Division of Soil and Veld Conservation.

A DEPARTMENTAL Soil-Erosion Committee toured the Union for a year, commencing in May 1939. The following synopsis of the report of the committee may provide useful information. The terms of reference were as follows:—

The State has been granting special facilities for the construction of small dams and anti-erosion works, and the Department of Agriculture and Forestry feels that the whole position should be reviewed with a view to determining:—

(*a*) The quality and permanency of works, particularly small dams constructed under the soil-erosion schemes.

(*b*) The extent to which small dams completed under the schemes have been successful intruments in achieving the following objects:—

(i) Combating erosion; (ii) providing water for stock-drinking purposes; and (iii) providing water for irrigation purposes.

(*c*) The extent to which the position in regard to soil erosion and generally in regard to *farming operations* has been improved, and whether in the circumstances the expenditure incurred may be regarded as justified.

To enable the Committee to arrive at reliable conclusions it is necessary to inspect a representative number of completed works.

Owing to the marked variations in soil, climate and farming operations the Committee may find it necessary, apart from any general conclusions applicable to the whole Union, to draw particular conclusions as to the effect the soil-erosion schemes have had in different areas.

The Committee should, furthermore, consult the magistrates, extension officers, and principals of colleges of agriculture with a view to obtaining full information in regard to the general effect of the soil-erosion schemes in the different areas.

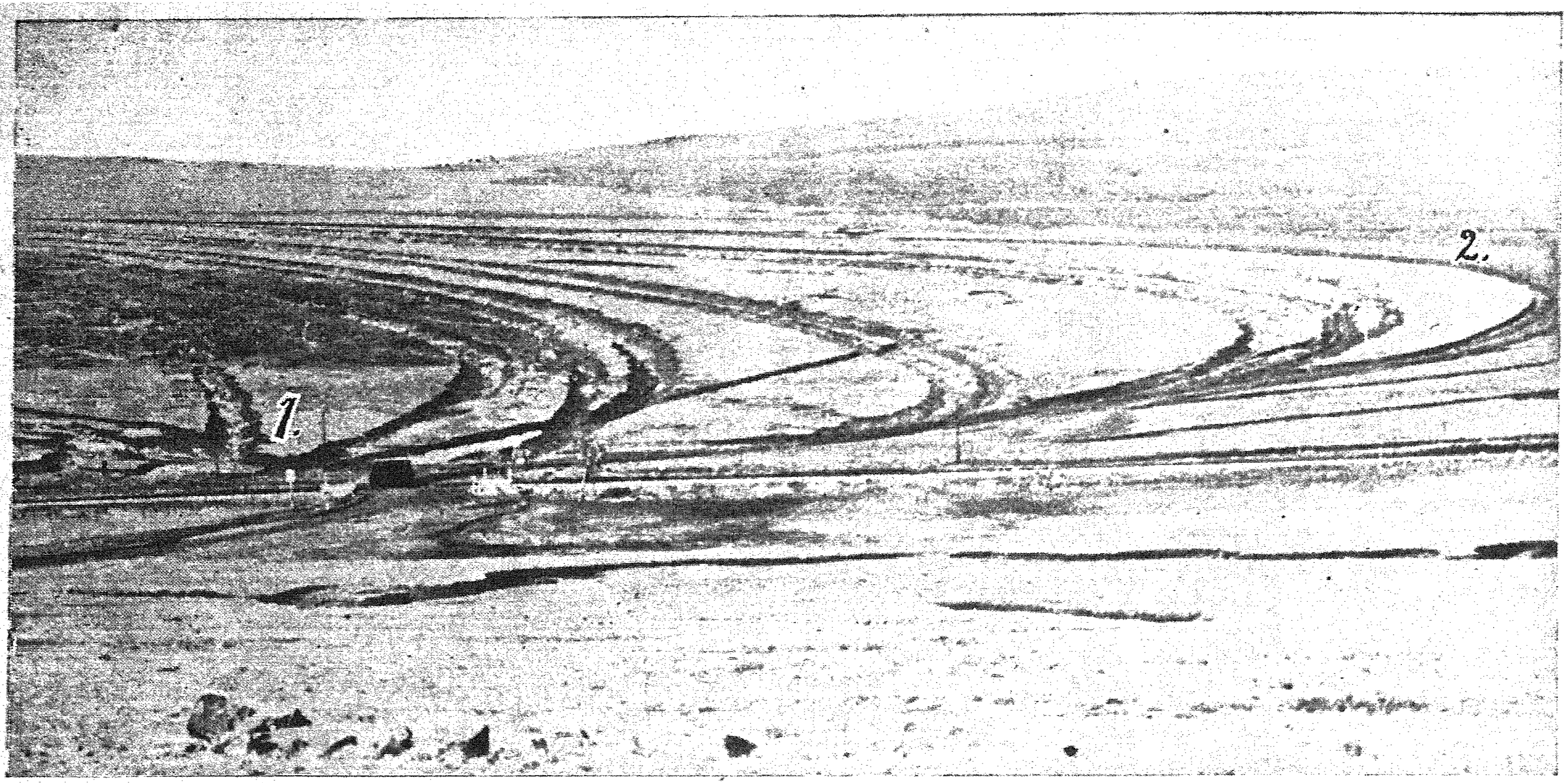
The personnel of the Committee consisted of the Senior Engineer of the Division of Soil and Veld Conservation, a professional officer and several extension officers of the Division of Animal and Crop Production.

(*a*) Quality and Permanency of Works.

In regard to section (*a*) of the terms of reference, the Committee toured 144 districts of the four provinces and inspected 1,377 completed representative works, constructed by 911 applicants. Of these works 90, or 6½ per cent., were condemned; in addition thereto it was estimated that the permanency of a further 2½ per cent. was doubtful.

Had the farming operations been conducted properly and on systems suitable to the climate, types of soils and veld concerned, these losses would have been considerably reduced.

The contributory causes of the non-permanency of works were many and varied. With the earthen embankment necessary for dam construction the most common cause was the lack of a protective covering of grass or other suitable vegetation to protect the earthwork against the ravages of wind and rain. It was distressing to note



An example of nature endeavouring to force man to farm on the contour. 1. The original road to the railway crossing on which the rail-car stands. 2. The present road whereon the destruction is still in progress. In the course of a few years nine inefficient roads have ruined a large area by sloot formation. Had the initial road been correctly made and drained no land abuse would have resulted.

that approximately 80 per cent. of such works were unprotected in spite of the fact that the majority of the works were several years old.

The reason for the unprotected state of these works were five-fold, viz.:—

(1) The upper soil layer of the embankments were comprised of subsoil. The common practice is to use the fertile top soil in the lower layer of the embankment, instead of scraping it aside, and later utilizing it on the upper surfaces for the encouragement of plant growth.

(2) Grass or other vegetal covering was very seldom planted and established.

(3) The slopes in many cases were much too steep, especially on the water side of unpitched embankments, in consequence of which the wave action caused the wetted surface to subside into the water until the resulting slope was such that further subsidence could not occur. Such subsidences constantly reduced the thickness of the embankments above the varying water levels in each dam, and thereafter the heights until the water escaped over the embankments and caused them to breach.

(4) Many dams were provided with insufficient freeboard and spilway width, which combination restricted to such an extent the passage of the flood water that it escaped so slowly that the dam embankment was submerged and consequently breached.

(5) Dams, or their embankments, were seldom fenced to exclude stock, and thus prevent general trampling and the formation of paths over, and along, the embankments, many of which were ruined thereby.

The non-permanency of contour and diversion banks in the veld was nearly always due to lack of grass cover, permitting erosion of the banks by wind and water. Stock-paths and the ravages of animals, such as ants, hares, antbears, porcupines, etc., were also contributory causes. In the case of contours in lands, breaches were caused by weed growth in the water channel, which prevented the unrestricted discharge of the diverted run-off. Breaches also resulted on account of their cross section being too small to cope with the area they served.

Failures of weirs were nearly always caused by leakages between the masonry or concrete portions and the earthen embankments usually incorporated in such works, resulting in breaches in the embankments.

The Success or Failure of Anti-erosion Works.

As regards section (*b*) of the terms of reference, the works were found to be successful in achieving the three objects mentioned. Unfortunately their presence did not influence the great majority of their owners to improve the incorrect farming systems practised, consequently their beneficial effects were very largely nullified. To express the utility of each work on a percentage basis was rather difficult, because some only achieved one purpose and others two or three. However, the allocation was estimated on the site of each work, and the result was: erosion combat, 35 per cent.; provision of water for stockwatering purposes, 22 per cent.; and conservation of water for irrigation, 43 per cent.

As regards section (*c*) of the terms of reference, the Committee found the improvement of the soil-erosion position generally to be disappointing.

The results obtained, however, were considered satisfactory because the "Anti-Soil Erosion and Small Dam Scheme" was

intended to benefit the country in many directions, the most important of which were the prevention and combat of erosion, the conservation of water above ground and the improvement of the underground water supplies, and most important of all the improvement of farming systems in all directions.

Where local improvements had been made their effects were adversely affected by the continued use of undesirable farming systems.

It was further found that the combat of erosion was practised to a much greater extent than its prevention, and unfortunately, was seldom attempted in combination with the utilization of vegetation.

The common practice was the construction of engineering works, many of which were expensive, for the local area benefited thereby. In many instances combative measures of more utility, and benefiting a greater area could have been substituted, and increased advantages gained at a reduced cost if full advantage had been taken of the vast possibilities afforded by the utilization of the plant population—sward, shrubs, bushes, trees, etc. Had every effort been made to increase the vegetation on the areas in the vicinity of the works they would have been rendered much more safe, and a more general and useful benefit to the areas concerned would have accrued.

The Effect of the Schemes in Different Areas.

Two areas in particular have proved that the beneficial effects possible to a district by the proper application of the schemes are enormous.

The district of Ladismith (Cape) was prosperous in the days of ostrich farming; thereafter it suffered from the feather slump, and the retrogression which was in evidence has only been checked by the utilization of the benefits obtainable under the soil-erosion schemes. The construction of hundreds of small conservation dams to impound water from mountain streams for irrigation purposes encouraged the establishment of vineyards on a very large scale. Under the watchful eye of the extension officer improved farming methods have been adopted to such an extent that prosperity is assured.

In East Griqualand, an area of slopes too steep for ordinary tillage, the top soil of the arable lands was eroding at an alarming rate. The grave danger was realized by one farmer who, prior to the introduction of the anti-soil erosion schemes, installed contour banks through his arable lands with such advantageous results that his example was followed by a few others, and with the subsequent assistance of the schemes nearly all the farmers in the district followed his lead. It is encouraging to record that after considerable experience the farming community there are convinced that proper contour-farming systems are the correct methods to adopt to save their arable lands.

The Effect of the Schemes in the Union.

The Committee concluded that the benefit to the Union as a result of the soil-erosion schemes was regrettably small. The anti-erosion works were distributed very thinly throughout the country and such localisation provided local, but little general benefit. In the case of the Ladismith district, works were much more centralized, consequently their collective benefit by the general improvement of the area was very evident.

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Paratyphoid in Calves.

Dr. M. W. Henning, Professor of Veterinary Science, University of Pretoria.

PARATYPHOID as a disease affecting calves has been known for more than 60 years in South Africa. It has always been regarded as infectious, but the nature of the infection was not known until 1926 when the cause was determined by Drs. Viljoen and Martinaglia. Since that time much information has been obtained regarding this disease and to-day it can be controlled with a large measure of success, provided the prescribed measures are carefully carried out.

Distribution.

At present paratyphoid is of widespread occurrence throughout South Africa. Formerly the warm bushveld, the Transvaal low-veld and the Eastern Cape Province were the most severely affected areas, but to-day severe outbreaks occur even in the cold highveld and the eastern Orange Free State. The disease therefore appears to be spread over a wider area, but this impression is due to the fact that paratyphoid has become better known and is now more easily diagnosed. In fact, the disease is now so well-known that farmers are sometimes inclined to ascribe their losses of calves to paratyphoid even though this disease may be entirely absent.

It was at first thought that this malady was mostly confined to ranches where large numbers of calves were herded together in dirty pens, but it is now known that owners of dairy herds in all parts of the country may suffer severe losses. The custom of herding calves in pens or small paddocks near the farmyard has undoubtedly been one of the principal reasons for the spread of the disease.

Calves are susceptible to paratyphoid between the ages of two weeks and four months, but in exceptional cases animals less than two weeks or more than four months old may also be affected. I have personally seen cases where symptoms of paratyphoid appearel a day after birth and death followed two days later.

Although calves exposed to infection may develop the disease at any time of the year, most cases of paratyphoid occur during the summer months when the calving season is at its peak and when, owing to the severity of tick infestation, the resistance of the young animals has been considerably reduced.

It is by no means unusual, however, for stock-owners to suffer severe losses in winter, especially in dairy herds where young calves are kept in unhygienic stables, kraals or paddocks. The writer has often diagnosed cases of paratyphoid in May, June and July.

Cause.

Paratyphoid is caused by a minute rod-shaped organism, known as *Salmonella enteritidis*, var. Dublin, which is closely related to the organism of enteric fever (*S. typhi*). Man is also highly susceptible to infection by the paratyphoid germ.

Paratyphoid infection may be transmitted to human beings, and especially children, by means of milk contaminated by germ-laden particles of dung. It happens very seldom that the milk is infected as it comes from the cow; contamination usually takes place after milking. In children paratyphoid bacteria appear to have a predilection for the meninges and may cause meningitis as well as enteritis and fever. In adults these organisms are the main

causes of so-called "food poisoning", which is total misnomer, as it is not a case of poisoning but one of infection. Eating contaminated meat, milk or other food leads to infection of the body and not to poisoning. It usually takes the form of a septicaemia or blood infection accompanied by gastro-enteritis.

Healthy calves become infected through the mouth. Food, milk, water and other articles infected with paratyphoid organisms are taken by the mouth; the germs then penetrate to the alimentary tract and multiply in the blood, the intestinal walls and other organs. The result is that large numbers of the bacteria are passed in the dung and also to a certain extent in the urine and other excretions. The whole environment of such a calf becomes badly infected and, therefore, extremely dangerous for healthy calves. The blood and organs like the liver and spleen of a sick or dead calf, also teem with paratyphoid germs. These can be readily found upon an examination of portions of the organs. It is therefore recommended that a piece of liver or spleen from a calf suspected to have died of paratyphoid be sent to the laboratory in a weak preservative, such as 50 per cent. glycerine; the specimens can then be used for bacteriological examination.

Symptoms.

The exact duration of the incubation period has not yet been determined. A healthy calf may begin to show symptoms from 2 or 3 days to a month after having been exposed to infection.

The very first symptom is a rise in the body temperature of 106° to 108° F. The calf's nose becomes dry, it appears dejected, is inclined to lie down most of the time and moves about listlessly. Its eyes are watering, its coat is staring, its nose is running and sometimes its eyes are deeply sunken. In most cases there is a certain amount of diarrhoea which is sometimes preceded by constipation. The dung is watery and yellow or yellowish gray in colour with an unpleasant smell. It may even show traces of blood, but a bloody diarrhoea is far more commonly a symptom of coccidiosis than of paratyphoid. The calf drinks very little, and may refuse to drink at all. In some cases there is pneumonia accompanied by rapid and laboured breathing with an occasional cough.

In acute cases the disease develops very rapidly and death may ensue within a day or two. In less acute or chronic cases the animal may live for a week or longer. Sometimes it will linger for weeks or months, in which case it will have a sickly and unhealthy appearance and remain much smaller than other calves of the same age. In some cases there may be swelling of the joints, and in others chronic pneumonia.

Lingering cases and those which have apparently recovered must be regarded as dangerous. They may remain carriers for a long time and in this way constitute a constant source of infection. It is usually such carriers which introduce the disease into a clean herd or farm, but it is often possible to detect their presence by an examination of the dung and blood for paratyphoid germs or products of the bacteria.

Lesions.

As a rule, the hindquarters of a sick calf are soiled with yellowish excreta. The eyes are deeply sunken and the general condition is poor. If the calf suffers from redwater or gallsickness simultaneously the mucous membranes will be pale or yellow, otherwise they will have a reddish colour. The most characteristic symptom, however,

will be observed in the liver, which becomes friable and brownish yellow, orange or dark yellow in colour. The organ is enlarged and on section reveals dull-coloured patches. Small necrotic foci or nodules are disseminated throughout the liver tissue, appearing like fine grains of yellow sand, but these may not always be visible with the naked eye. The name " lewersiekte " is derived from these changes in the liver. The gall-bladder is usually filled with a thick greenish or yellowish-brown bile, the condition of which is, however, of no value whatever in making a diagnosis.

The spleen may also be slightly enlarged and, like the liver, contain small necrotic foci or nodules which are, however, not so easily recognised.

In some cases the lungs are also affected, parts of the lung tissue being consolidated and hard, with the appearance of flesh or liver, quite unlike the soft, elastic and light red unaffected parts. Cutting the affected part will reveal a greyish-red tissue containing a number of small abscesses. In chronic cases the lungs may sometimes be badly affected and there may be adhesions to the ribs.

There are always found hard lumps of casein in the abomasum of calves that are fed on milk; the mucous membrane of the intestine is abnormally red. The intestinal contents are yellowish in colour or may be slightly red or even tinged with blood.

Diagnosis.

If the symptoms manifested prior to death correspond to those described above, and if the liver of the dead animal has a brownish-yellow colour and diffuse necrotic nodules resembling grains of sand are disseminated throughout its tissue, a diagnosis of paratyphoid may be made with a fair degree of certainty. It will be difficult, however, to diagnose the disease if the farmer cannot recognise these nodules in the liver. Moreover, there are a number of calf diseases which may be confused with paratyphoid and the possibility of their presence must first be excluded before a diagnosis can be made.

One of the principal diseases which may be mistaken for paratyphoid, is calf pneumonia. The disease also causes a number of changes in the lungs resembling those caused by chronic paratyphoid.

Diseases like gallsickness, redwater and even heartwater are sometimes erroneously diagnosed and treated as paratyphoid, with the result that the farmer often treats his calves for a particular disease when they are actually dying from quite a different malady.

It frequently happens that calves are exposed to severe infestation by ticks which not only reduce the vitality of the animals directly by their parasitic effects but also by acting as carriers of one or other tick-borne disease.

Should these calves now be exposed in addition to paratyphoid injection they are liable to contract paratyphoid as well as redwater, gallsickness or heartwater.

There are also a number of other affections of the alimentary canal caused by improper and irregular feeding that may be confused with paratyphoid. The most important of these is common " white scours ". Although it may seriously affect the calf's health it is by no means as deadly as paratyphoid.

The most common direct cause of " white scours " is also a bacterium, viz. Bacillus coli, which is a common inhabitant of the intestinal tract. As a result of some form of irregularity and disturbance of the digestive system this organism becomes virulent and causes diarrhoea.

Whenever losses are, therefore, sustained in calves, a proper diagnosis should first be made before preventive and control measures are inaugurated. If paratyphoid is suspected, a piece of liver and spleen in a preservative like 50 per cent. glycerine should be sent for diagnosis to the laboratory—should the lung also be affected, a part of this organ must be included. If no glycerine is available, the specimen may be packed in salt, but glycerine is always preferable as it preserves the bacteria present in the organs; these can be isolated in the laboratory and if necessary, used for the preparation of vaccine. For pathological study small pieces of organ should be submitted in 10 per cent. formalin. If there is blood in the manure or dysentery coccidiosis may be the cause of the diarrhoea. In order to recognise the disease it is advisable to submit a piece of affected large intestine, tied at both ends, together with the other organs.

Blood smears should also be taken from each calf and sent to the laboratory for diagnosing cases of redwater and gallsickness. Unfortunately, it is not possible to diagnose heartwater by means of a blood smear. It is imperative, however, that the specimens should be taken as soon as possible after death so that decomposition does not set in; this would render the material unsuitable for diagnosis. Sometimes it may be advisable to destroy a sick calf in order to obtain fresh specimens.

If the specimens are taken in the prescribed way, it will be possible to determine whether paratyphoid, coccidiosis, redwater, gallsickness or calf-pneumonia is the cause of death.

The writer has often carried out a post-mortem on calves affected simultaneously with paratyphoid and red-water or gallsickness, and in one case the animal was suffering from worm infestation as well as paratyphoid, redwater and gallsickness.

Preventive and Control Measures.—The treatment of a sick calf cannot be recommended. By disseminating the bacteria with its excretions, the affected calf remains a dangerous source of infection. It can contaminate the kraals, the stables and the whole environment. The longer it lives, the longer it is able to spread the disease and should it recover, it will linger for some time and possibly remain a carrier for the rest of its life. As pointed out before, such carriers are frequently responsible for the introduction of the disease into clean premises. If it is decided to keep the sick calf alive, it should be isolated immediately in a place provided with a concrete floor, so that the excretions can be effectively destroyed. Not only should other calves be rigidly excluded, but even attendants must not be admitted into the isolation pen unless every precaution has been taken to prevent dissemination of the infected discharges. By examining the dung and urine of a "recovered" calf, it may be possible to determine with a fair amount of certainty whether it remains a carrier.

The prevention of the disease in healthy calves is the most important control measure that should be applied.—This can be achieved by the simultaneous application of the following measures:—

1. *Environment.*—No condition is more favourable for paratyphoid than the exposure of calves to stables and kraals where manure has been allowed to accumulate. Small paddocks near the kraals and farmyard are equally dangerous. On no account whatever should calves be admitted into these surroundings. They should be kept strictly in clean, well-ventilated sheds or kraals with concrete

floors that can be cleaned daily so that every bit of manure or other infected discharge can be carefully removed. The calves should be fed regularly twice a day on pure milk in clean buckets which are removed immediately after the feeding. They should be kept in the stables for at least four months but they may receive some hay or grass every day provided the mangers are regularly cleaned and the food is not left too long. Contamination of the food with manure should, however, be guarded against. If these measures are properly carried out the chances of infection will be greatly reduced.

In dealing with very valuable animals where the owner is prepared to devote special attention in combating the infection, the following additional control measures can be applied:—

A clean airy stable or pen with a good concrete floor must be available. The pen should be provided with a roof to protect the calves against sun, wind and rain. The pen or stable is partitioned off into a number of smaller compartments in each of which one calf is housed. There should be a suitable passage between the compartments, however, so that the animals can be reached easily as they must be fed on the spot. The concrete floors must be cleaned regularly every day and all hay or grass left over from the previous day must be removed. The calves are not allowed out before the age of 4 months when they are taken to a clean camp.

The greatest disadvantage of keeping calves in these compartments is that they get no exercise. They are prevented, however, from licking or chewing objects which may be contaminated with infected dung.

Some farmers consider that the same object may be achieved by tying the calves separately to trees for the required period. The calves should also be fed on the spot, but it is essential that the place is free from infection.

(2) *Tick infestation.*—The calves must be kept scrupulously free of ticks so that they cannot become infected with red-water, gall-sickness and heartwater parasites.

(3) *Inoculation.*—All calves should be inoculated with paratyphoid vaccine within a week of birth, a second injection being given approximately one week later. As the first injection may sometimes cause a fatal shock within an hour or two, the calves should be handled and inoculated very carefully. Keep them quiet before and after the inoculation and give the injection when it is cool. If the disease is very severe a third injection may be given after 30 days (not sooner). It is advisable also to inoculate the calves kept in the pens with concrete floors in the usual way.

Generally speaking, inoculation with paratyphoid vaccine, as is the case with inoculation against enteric in man, gives a fair degree of resistance to the disease, but this immunity is not as strong as that which can be obtained with the vaccines used for quarter-evil and anthrax. Sometimes the vaccine fails to protect calves exposed to infection in dirty, dark stables or in severely infected kraals or paddocks. Moreover, it will not always effectively prevent losses if calves are not kept free of ticks.

(4) *Feeding.*—Clean milk should be fed to the calves regularly twice daily. During the first week they require the colostrum but after that they should be given an adequate supply of ordinary milk. Excessive quantities of milk are just as harmful as insufficient amounts.*

Irregular feeding is a common cause of gastric disorders and is liable to render the calves highly susceptible to paratyphoid infection.

Under ranching conditions and in other cases where it is not

necessary to milk the cows, the safest procedure is to allow the calves to run with their dams but under no circumstances should the animals be allowed to come near the farm-yard or to enter infected kraals or paddocks. It is the farm-yard, kraals, stables and small paddocks near the kraals which are usually infected; those are, therefore, the most dangerous sources of infection. Experiments conducted in the laboratory by the writer have shown that infected dung which was dried and kept in a bottle was as badly infected after 900 days as it was on the first day. Whether this is also the case with infected dung in kraals, paddocks and stables has not yet been proved, but it may reasonably be concluded from the laboratory experiments that infected dung will remain a source of infection for a very long period.

Since conditions are not identical on all farms, it is difficult to propose control measures which can be applied on every farm; but most farmers should be able to modify the suggested measures in such a manner that they can be applied to their own particular farms. Whatever course they adopt, however, they must always bear in mind that, although the vaccine confers on the calves a large measure of resistance to the disease, the immunity will not always be effective if the animals are kept in dirty, infected surroundings and are exposed to tick infestation at the same time.

In cases where a farmer continues to suffer losses in spite of the application of hygienic measures and inoculation, a special vaccine can be prepared for the control of the disease on his particular farm. In that event the farmer should, as has already been pointed out, send to the laboratory a portion of the liver and spleen of the infected calf. The specimen should be dispatched in 50 per cent. glycerine. If paratyphoid bacteria are found in the organs submitted they can be used for the preparation of a vaccine.

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* See "Dairy Farming" by Schreuder and Groenewald, Bulletin 111, obtainable from the Department at 6d. per copy.

Mottle Leaf or Mosaic Chlorosis of Appels:—

[*Continued from page* 34.

2. The disease is transmitted by budding or grafting infected material on healthy trees. Apparently the infectious principle is not transmitted by means of pruning.

3. All the commercial apple varieties seem to be subject to the disease. In Golden Delicious orchards the percentage infection is always very high.

4. The indications are that the disease is harmful to the growth and production of the tree.

5. Nurserymen and fruitgrowers are advised to select their bud and graftwood in future from mosaic-free trees only.

Pear-packing Experiments.

T. Micklem, D. du Preez and Dr. M. W. Black, Pomologists, Western Province Fruit Research Institute, Stellenbosch.

DURING the 1943 pear-packing season experiments were conducted with the object of testing out cheaper packing methods for local markets, and to standardise such methods. In an exploration of the factors governing cheapness of packing, it was found that the cost of container played a major rôle. The possibility of using hessian bags, bushel baskets and open lugs was considered. These methods were, however, discarded as being impracticable: hessian bags and

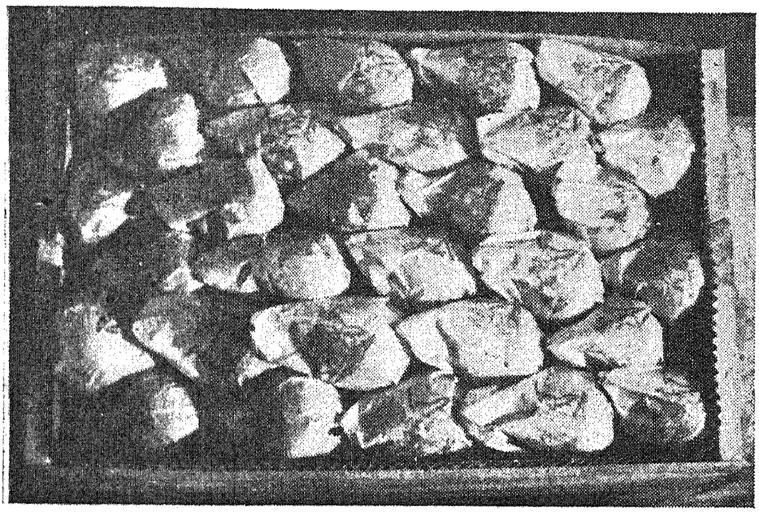

FIG. 1(a).—Top view, low net-weight pack (41¾ lb.).

bushel baskets both because they were unobtainable in sufficient quantities; and in the case of bushel baskets, as a result of American experience (2), and open lugs, because it was thought that they were too expensive, would encourage pilfering and would probably cause chafing. If in this latter instance the lugs were to be used, as returnables, then the cheaper standard Californian Bushel was thought to serve the purpose better. Having discarded these methods, it was decided that the most suitable types of containers were the standard Californian half bushel and bushel boxes. The use of single layer trays was also tested, although it is felt that this type of container should be discarded, due to relatively high container cost. In America bushel box containers have proved most successful for both exporting and local marketing of pears. Furthermore, it must be remembered that when export is resumed, our pears will again have to compete with the standardised American article, which arrives on the overseas market before ours, and in far greater quantities. In the past our standardisation of pear packing has never achieved the range of uniformity reached by American packers.

Experimental Procedure.

The variety, Bon Chretien, was selected for this study, as representative of a class of pears likely to give the most packing problems. Five consignments of fruit were packed, two at Welgevallen, Stellenbosch; and one each at Meerlust, Groot Draken-

stein; Bien Donné, Groot Drakenstein; and Eikenhof, Elgin. (The pears packed at Eikenhof came from G. Rawbone, Esq., Oak Valley, Elgin.)

A wide range of different methods of packing were tested, existing methods being compared with cheaper experimental packs. Repre-

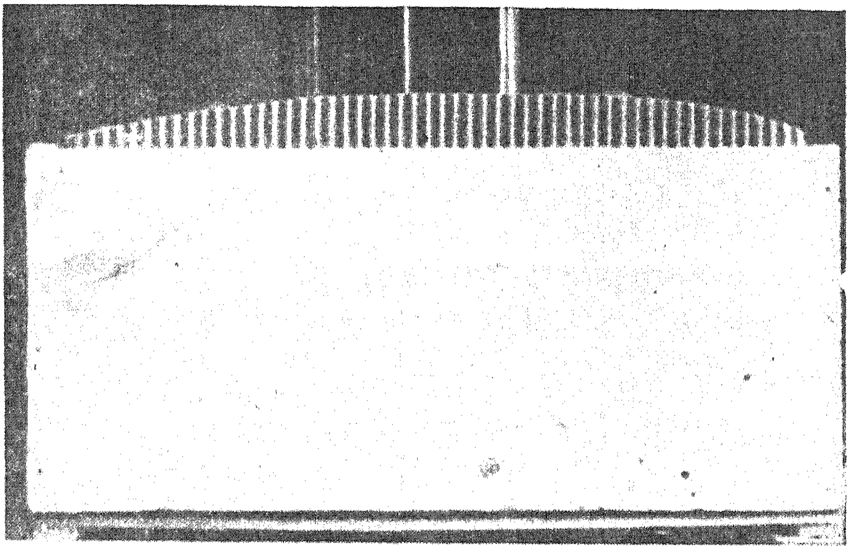

FIG. 1(*b*).—Side view, showing low bulge.

sentative examples covering the range of these different packing methods were in most cases subjected to the following storage and transport treatments:—

1. Direct to Johannesburg per hot truck.
2. Direct to Johannesburg per cold truck.
3. Cold stored for 2 weeks in the Table Bay Docks. Cold Store and then sent to Johannesburg per cold truck.
4. Same as 3, only cold stored for 4 weeks.
5. Same as 3, only cold stored for 6 weeks.

With treatments 3, 4 and 5 replicate samples were also forwarded to Stellenbosch for examination.

On arrival, and also on ripening, the different packs were examined in detail, and the general appearance, percentage bruising, breakdown, stage of ripeness, storage life, etc., were recorded. With the system outlined above, it was possible to compare the condition of fruit on leaving the cold store, with the condition of similar fruit on arrival in Johannesburg.

Certain other studies were also made. The shrinkage on storage of Bon Chretien pears was determined, data on the relationship between size and weight of fruit was collected, and data on packing methods was obtained from some of our more important commercial packsheds. The performances of certain types of mechanical graders were also tested.

Different Packing Methods Tested.

(1) *Californian Bushels.*—(*a*) Wrapped in boxes lined with brown corrugated paper liners (old export pack): With this pack a range of net weights from 40-50 lb. per bushel were packed.

(*b*) Alternate rows wrapped, boxes lined with brown corrugated liners.

(*c*) Alternate layers wrapped, boxes lined with brown corrugated liners.

(*d*) Wrapped, boxes lined with "greenkraft".

(*e*) Wrapped, in unlined boxes.

(*f*) Unwrapped, boxes lined with brown corrugated liners, paper sheets between layers.

(*g*) Unwrapped, in unlined boxes, with corrugated pad top and bottom.

Treatments (*a*), (*d*) and (*e*) were repeated with unwrapped fruit.

(2) *Half Bushels* (*triple layer*).—(*a*) Wrapped, boxes lined with brown corrugated liners (old export pack).

(*b*) Same as (*a*), only unwrapped.

(3) *Trays* (*single layer*).—(*a*) Wrapped, trays lined with wood-wool (old export pack).

(*b*) Wrapped, trays lined with white corrugated liners (as used for plums).

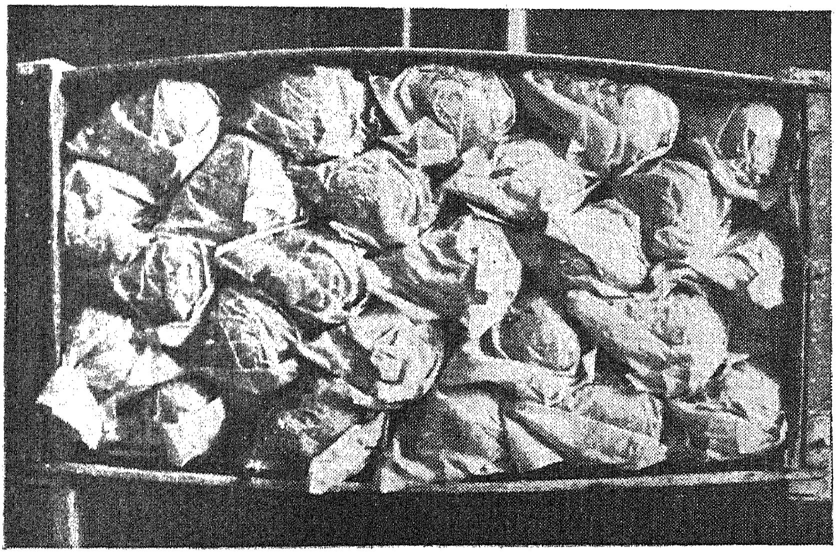

FIG. 1(*c*).—Side removed, after nailing, and pack already showing signs of slackness.

(*c*) Diagonal rows wrapped, trays lined with white corrugated liners.

(*d*) Wrapped, trays lined with greenkraft.

(*e*) Wrapped, trays not lined.

(*f*) Unwrapped, in *Pinus insignis* shavings.

Treatments (*a*), (*b*), (*d*) and (*e*) were repeated with unwrapped fruit.

Summary of Results of Packing Experiments.

The detailed results obtained from this complex experiment are too bulky for the scope of this report. A summary of the more important results obtained is now given. This has been arrived at after a detailed analysis os the results obtained from all the consignments.

A. *Bushel Packs.*

1. *Tightness of pack.*—With the standard wrapped, corrugated paper lined bushel pack, sagging of bulge with jumbling and resultant bruising and chafing resulted when the net weight of 40-43 lb. of fruit were packed per bushel. This fault was remedied by packing net weights ranging from 44 to 50 lb. of fruit per bushel. With these weights, the pack remained firm and neat, and there was no chafing and little bruising. On the Johannesburg market buyers were in favour of this bulged, high net weight pack. Dreyer and Putterill (1) also found that when fruit is roughly handled, more damage takes place in slack than in tightly packed boxes.

2. *Wrapped vs. Unwrapped Fruit.*—The wrapping of fruit led to neater, more attractive fruit packs, and reduced chafing considerably, while Bon Chretien pears that were not cold stored, ripened better and more evenly when they were wrapped. When pears were

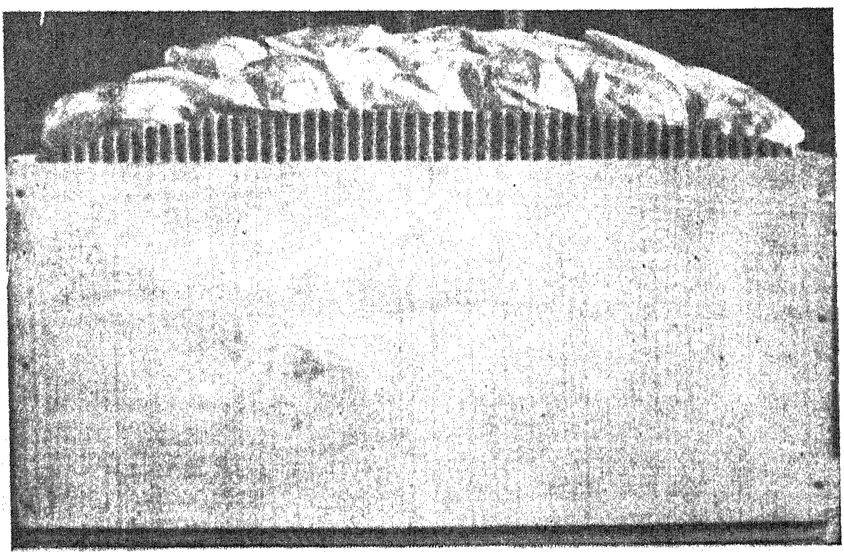

FIG. 2(*a*).—Side view, ekstra high net-weight pack (47¾ lb. nett).

not wrapped, packs jumbled in transit, and bruising and chafing was bad in top and bottom layers, as well as on ends and sides. The alternate layer wrapped pack was satisfactory, but not quite as good as the wrapped pack, as unwrapped fruit tended to chafe where in contact with liners. With this pack, it is essential that top and bottom layers should be wrapped. This pack reduces the number of wrappers used by 40 to 50 per cent.

3. *Liners.*—In the case of bulged packs, suitable curved corrugated cardboard liners are essential. The quality of the standard type of liner used is poor, and it is thought that the glazing of the inner surface would be a big improvement. The corrugated cardboard pads used at top and bottom of bushels are not always completely effective in controlling pressure marks and bruises.

4. *Storage Life.*—There were indications that on storage Elgin pears could not be kept as long as those from Groot Drakenstein.

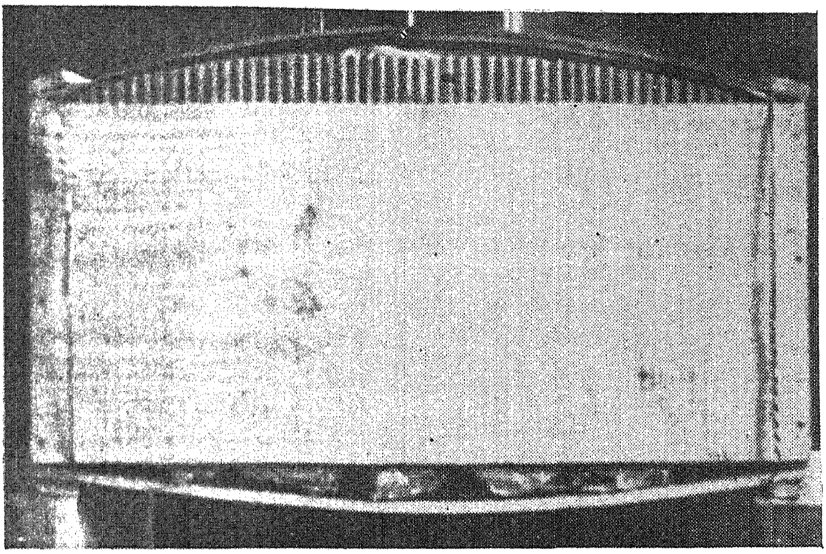

FIG. 2(*b*).—Side view after lidding and wiring.

Storage life can be affected by a host of factors, and it would be misleading to take these indications as conclusive evidence after only one season's work. In America it has been shown that the climate of different pear growing districts markedly affects the keeping quality of the fruit. Magness (3) states that "Bartlett pears grown in countries bordering on the coast of California are uniformly poor in carrying quality. They become soft ripe quickly after removal from the tree, and have a marked tendency to soften and become overripe at the core, while still apparently firm on the outside". It, therefore, seems important, especially in regard to future distribution and marketing methods that the keeping quality of pears from different districts be further investigated.

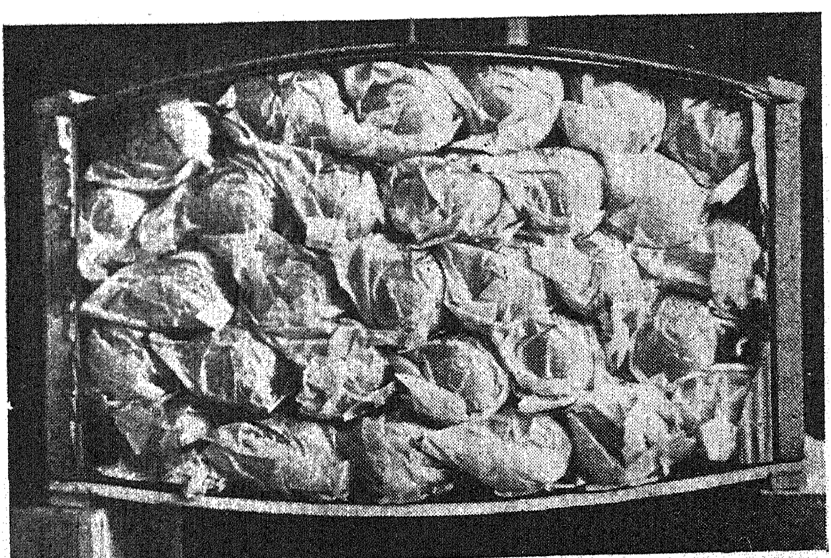

FIG. 2(*c*).—Side removed, after lidding, and showing tightness of pack.

Pears that were not cold stored and sent to Johannesburg per hot truck, did not keep nearly as well as when sent per cold truck.

B. *Trays.*

Wrapped packs were more attractive than unwrapped ones, and proved satisfactory with all types of lining material used. Unwrapped fruit only carried well when trays were lined with woodwool, or with white corrugated liners. Unwrapped fruit packed in pine shavings kept well. With this pack the box is first lined with greenkraft, to prevent shavings escaping. All the other unwrapped packs caused bad bruising and chafing.

Standard Packing Methods.

Various systems of packing were tested, and it was found that the standardised range of packs and counts, as recommended by the Californian Fruit Exchange (5) could not be improved on. As has been shown by Micklem (4), these packs are easy to apply, and in this study they were adhered to and found most convenient. Presentation of these methods is given in Table I.

TABLE I.—*Standardised Packs and Counts for Californian Bushel and Half Bushel Containers.*

STANDARD CALIFORNIAN BUSHELS.					HALF BUSHELS.				
Pack.	Rows.	Count.	Tiers.	Mark.	Pack.	Rows.	Count.	Tiers.	Mark.
2 × 3	7	70	4	70	2 × 3	7	53	3	50
2 × 3	8	80	4	80	2 × 3	8	60	3	60
2 × 3	9	90	4	90	2 × 3	9	68	3	65
2 × 3	10	100	4	100	3 × 3	8	72	3	70
2 × 3	11	110	4	110	2 × 3	10	75	3	75
3 × 3	8	120	5	120	2 × 3	11	83	3	80
3 × 3	9	135	5	135	3 × 3	9	81	3	80
3 × 3	10	150	5	150	3 × 3	10	90	3	90
3 × 3	11	165	5	165	3 × 3	11	99	3	100
3 × 3	12	180	5	180	3 × 3	12	108	3	110
3 × 3	13	195	5	195	3 × 3	13	117	3	115
3 × 4	12	210	5	210	3 × 4	12	126	3	125
3 × 4	13	228	5	225	3 × 4	13	137	3	135
3 × 4	14	245	5	245	3 × 4	14	147	3	145

According to Michlem (4) some additional packs are required, to ensure the packing of the Louise Bonne variety at 45 lb. net in smallest grades. At that time the minimum size allowed for Louise Bonne was 1⅞ in. These packs are now given:—

Pack.	Rows.	Count.	Tiers.	Mark.
4 × 3	10	210	6	210
4 × 3	11	231	6	230
4 × 3	12	252	6	250
4 × 3	12	273	6	270

Comparison of packs from hand and mechanically graded fruit.—Samples of Bon Chretien pears from Welgevallen and Bien Donné were carefully hand graded and weighed. From this data it was possible to calculate the approximate pack required to fill a bushel with any specified net weight of fruit. In Table II this has been done for a net weight of 45 lb., and results have been compared with those obtained when a mechanical grader was used.

TABLE II.—*Counts required to pack 45 lb. net weight of wrapped Bon Chretien Pears in Californian bushels.*

BIEN DONNE AND WELGEVALLEN.		COMMERCIAL PACKSHED (4).	
Diameter in inches. (Grading plank)	Count.	Setting of mechanical grader in inches.	Count.
2	—	2	210-195
2⅛	—	2⅛	195-180
2¼	195-180	2¼	165
2⅜	180-165	2⅜	150
2½	165-150	2½	135-120
2⅝	135-120	2⅝	110
2¾	110-100	2¾	Packed in trays.
2⅞	100- 90	2⅞	„
3	90- 80	3	„
3⅛	80	3⅛	„

Efficiency of mechanical graders.—Results given in Table II show that for similar mechanical-grader and hand-grader settings, less pears were required to pack 45 lb. net in the case of the mechanical grader. In Table III the performance of the mechanical grader used at Welgevallen has been analysed (circular rubber-band twin-feed belt type).

TABLE III.—*Showing percentage of Fruit Falling in Different Bins.*

Mechanical grader setting in inches.	DIAMETER OF FRUIT IN INCHES (GRADING PLANK).								
	2.	2⅛.	2¼.	2⅜.	2½.	2⅝.	2¾.	2⅞.	3.
First Bin..........2″	52	40	8	—	—	—	—	—	—
Second Bin........2⅛″	3	57	38	2	—	—	—	—	—
Third Bin..........2¼″	—	2	52	38	8	—	—	—	—
Fourth Bin........2⅜″	—	—	18	56	25	1	—	—	—
Fifth Bin..........2½″	—	—	—	23	48	28	1	—	—
Sixth Bin..........2⅝″	—	—	—	—	6	63	31	—	—
Seventh Bin........2¾″	—	—	—	—	—	8	78	14	—
Eighth Bin.........2⅞″	—	—	—	—	—	—	—	71	29
Ninth Bin..........3″	—	—	—	—	—	—	—	33	67

The above data shows that up to four grades fall into any one bin, resulting in differences of ½ in. in diameter between fruit in that bin. Furthermore, on the average 27 per cent. of the fruit had a greater diameter in cross section than that allowed by the grader setting, while 10 per cent. had a smaller diameter. This characteristic behaviour of a mechanical grader is due to the fact that the feed belts do not necessarily clasp the pear at its point of greatest diameter in cross section. The results explain the differences shown in Table II. The efficiency of a mechanical grader also varies with the type, speed at which it is run, and the accuracy of the setting.

Shrinkage.

Any shrinkage of individual fruits that occurs after packing, causes a slackening of the pack. When pears shrink in a bushel pack, the resultant loosening is accentuated by the multiple layer

TABLE IV.—*Shrinkage and Ripening of Bon Chretien Pears from Welgevallen, Stellenbosch.*

DATE AND STAGE OF PICKING AND STORAGE TREATMENT.	DIAMETER IN CMS., SPECIFIED IN NUMBER OF DAYS AFTER PICKING.											DATE TAKEN IMMEDIATELY AFTER STORAGE.					
	On picking.	1.	2.	6.	7.	8.	13.	14.	17.	23.	Total shrinkage per fruit.	Av. No. of pips per fruit.	Pressure in lb.	Light green %	Yellowish green. %	Yellow. %
ery green, picked 12/1/43, stored in packshed for 13 days................	6·27	6·14	6·11	6·03	—	—	5·94	—	—	—	·33 cms.	4·86	4·59	33	47	20
orrect picking stage, picked 12/1/43, stored in packshed for 13 days.......	6·45	6·42	6·39	6·31	—	—	6·23	—	—	—	·19 cms.	4·25	1·09	—	25	75
ery green, picked 12/1/43, cold stored at 34° F. for 14 days and then ripened at 60° F. for 9 days.................	6·28	6·23	6·20	6·18	—	—	—	6·16	—	6·07	·21 cms.	5·30	Not recorded.	—	30	70
orrect picking stage, picked 12/1/43, cold stored at 34° F. for 14 days and then ripened at 60° F. for 9 days.....	6·30	6·24	6·23	6·20	—	—	—	6·15	—	6·07	·23 cms.	5·00	Not recorded.	—	17	83
ery green, picked 18/1/43, stored in packshed for 7 days.................	6·29	6·23	6·21	—	6·17	—	—	—	—	—	·12 cms.	3·75	15·09	100	—	—
orrect picking stage, picked 18/1/43, stored in packshed for 7 days........	6·35	6·30	6·29	—	6·24	—	—	—	—	—	·11 cms.	3·58	2·66	—	75	25
ery green, picked 18/1/43, cold stored at 34° F. for 8 days and then ripened at 60° F. for 9 days................	6·44	6·38	6·37	—	—	6·35	—	—	6·25	—	·21 cms.	5·00	Not recorded.	—	33	67
orrect picking stage, picked 18/1/43, cold stored at 34° F. for 8 days, and then ripened at 60° F. for 9 days.........	6·54	6·51	5·49	—	—	6·47	—	—	6·38	—	·16 cms.	4·91	Not recorded.	—	—	100

pack. The results given in Table IV show the amount of shrinkage occurring with Bon Chretien pears, which were picked at different stages, and given different storage treatments. For each treatment a unit of 16 pears were selected for uniformity. The shrinkage was measured with a Vernier caliper. This work was done by A. F. de Wet, Esq., of this Institution. (See Table IV.)

Results indicated that Bon Chretien pears shrink continuously during storage, shrinkage being most rapid during the first 24 hours after picking. When the fruit was cold stored immediately after packing, the rate of shrinkage was slowed down. In practice, however, fruit seldom reaches the cold store within this period. The shrinkage of pears in storage and the settling of the pack due to jolting in transit and due to softening of wrappers and liners on removal from cold storage, combined with a lessening of the resilience of the container to inside pressure, all combine to cause a slackening of the pack. This results in jumbling, bruising and chafing, which is accentuated in the case of slack low net weight packs.

Recommendations.

1. Packs and counts of bushels and half bushels should be standardised along the lines suggested in Table I.

2. With the standard wrapped Californian bushel pack, at least 44 lb. net weight of Bon Chretien pears should be packed per bushel. When this is done, it is essential that bushels should have top and bottom cleats and should be wired.

3. Pears destined for distant markets should be despatched as soon as possible after packing.

4. To bring down the costs of bushels and half bushels, ways and means should be evolved, whereby these containers could be returned and used two or three times during a season.

5. Supplies of wrapping tissues should be conserved for pear packing in preference to peach and plum packing.

6. Containers should be handled more carefully in transit to and on our inland markets.

Acknowledgements.

The costs of these experiments were largely defrayed by the Deciduous Fruit Board. The authors would also like to thank the Manager and Assistant Manager of the Deciduous Fruit Board for arranging storage facilities for experimental packs; Mr. N. H. van der Meulen, Division of Economics and Markets, for obtaining data on the condition of fruit on arrival at Johannesburg. Thanks are also due to H. W. Blackburn, Esq., Elgin, and Pickstone & Son, Groot Drakenstein, who supplied the fruit and allowed same to be packed in their packsheds.

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Soil Erosion Works and Farming Systems:—

[*Continued form page 38.*

To achieve results on the 107,000 occupied farms in the Union equal to those obtained in the Ladismith district is a huge, but not impossible task.

In very few cases have the maximum benefits obtainable from completed soil-erosion works of all types been utilized as they ought to have been, because injudicious grazing methods and incorrect use of arable land are still practised, and will continue in vogue until arrested by education and/or invoked by legal and/or other means.

The educational value of the schemes has been considerable, nevertheless much greater educational efforts are necessary. The Committee throughout its investigations was impressed by the number of government officials and of the public who stressed the pressing need for education to inculcate a love of the soil upon the population.

The children, even before the commencement of their scholastic career, should be taught to love the soil, and this teaching should be continued during adolescence, by making soil conservation a compulsory subject in the carriculum of all schools, colleges and universities. The adults, urban as well as rural, must change their present attitude towards the soil, and be made to realize that their prosperity, and that of their country, is founded thereon. This can be accomplished by intensive propaganda, so intensive in fact that even the pulpit can be used without sacrilege.

To achieve the practical solution of the series of complex problems, combined with their vast and varied ramifications, requires the combined efforts of the entire populace. The almost general practice of incorrect farming systems, nearly always necessitated by over-capitalization, is the direct cause of the loss of soil fertility which is rampant, and to rectify matters by the gradual introduction of farming systems, suitable to the climate, soils and vegetation types of each farm, is a complicated task requiring the utmost care and forethought in a multitude of directions. Hence the need for the whole-hearted co-operation of the populace.

The time to act is now while the soil is sick, but still lives—after the soil is dead it will be too late.

Brine in Refrigerating Systems.

IN view of the critical position in regard to Sodium and Calcium brines, and also in view of the need for reducing corrosion in refrigerating plants to a minimum, the Officer-in-Charge of Dehydration and Cold Storage, P.O. Box 3, Cape Town, has drawn up notes on the uses of brine in refrigerating plants, and methods of testing such brines.

Readers who are interested in the subject can apply to the above address for copies of the notes and also obtain particulars about advice and assistance on any problem connected with the use of brines.

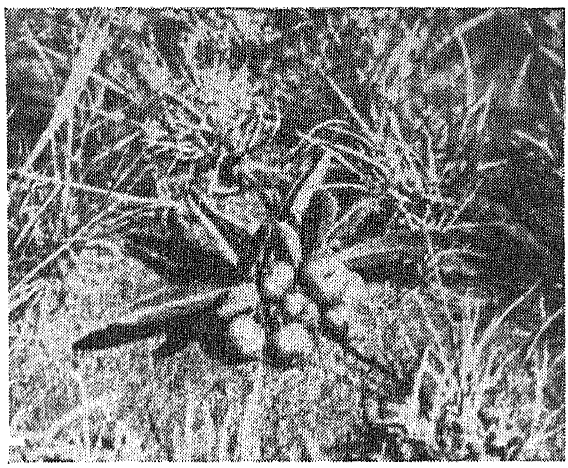
"Gousiekte" and its Control.

Dr. Douw G. Steyn, Onderstepoort.

GOUSIEKTE occurs in sheep and cattle and is caused by the gousiektebossie which contains a poison which mainly affects the heart, causing a chronic inflammation of its muscles, thereby seriously weakening it.

Habitat of the Poisonous Plant.

Up to the present the gousiektebossie, or witappeltjie [*Pachystigma* (*Vangueria*) *pygmaeum*] has been found only in Natal, Transvaal, north-western and north-eastern Orange Free State. In Trans-



Pachystigma pygmaeum (Gousiektebossie) (1/6 of normal size.)

vaal it is found in the highveld and also in the bushveld of western Transvaal. The plant has an underground stem with a branched root system, and where it appears above the ground it bears from four to eight narrow leaves (from 1½ to 4½ inches long, and 1 to 1½ inches broad) which have a green or yellowish-green colour, and are hairy on both sides. The leaves usually appear in October or November, and the flowers, which are of a yellowish-green colour, early in December. About the middle of January the fruit (apples about the size of a walnut) matures.

Dangerous Period.

The roots of the gousiektebossie penetrate the soil very deeply, consequently it gets more moisture and is thus more resistant to drought than shallow-rooted plants. It is, therefore, especially in dry seasons and after recent burning of the veld, that animals eat the leaves and fruit which are then practically the only green growth on the veld. However, the plant is not always poisonous to the same degree, which, to a certain extent, may be due to the nature of the soil and climate. In some years, many animals may die as a result of eating the shrub, while in other years no losses may occur.

Symptoms of the Disease.

As the name of the disease implies, death in most cases comes in the form of a sudden collapse. The animal does not die imme-

diately after eating the shrub, and though it may appear to be in good health, the disease is gradually developing in it. As a rule, animals develop gousiekte from about 2 to 8 weeks after having ingested the plant. Affected animals very seldom recover. If driven about, they soon tire, fall down, and gasp for breath with lolling tongues. The majority of affected animals, however, suddenly collapse from heart failure caused by the poison. Some wheel round in a circle or suddenly leap into the air and drop down dead. In less acute cases, they cannot keep up with the herd, but stand apart with outstretched head and neck. In such cases, which are of rare occurrence, the animal may live for one or more days. Affected animals do not eat well; they breathe quickly—often 100 respirations per minute—the body jerks, and the nostrils are distended but they show no signs of fever.

Post-mortem Phenomena.

In many cases, animals dying from gousiekte show an entirely negative post-mortem. In some cases there are large quantities of a clear, watery fluid in the abdominal and thoracic cavities and in pericardial (heart) sac. The heart is much enlarged, the chambers distended and filled with blood; in very chronic cases the heart walls are much thinner and firmer than in normal sheep or cattle; in such cases the colour of the heart is light red. In some cases the liver and spleen are also somewhat enlarged.

Send specimens of the heart in 10 per cent. formalin to the Director of Veterinary Services, Onderstepoort, Pretoria, for microscopic examination. Formalin is obtainable from pharmacy shops.

Precautions and Treatment.

Since the cause of the disease is known, animals subject to it should be kept away from grazing where the shrub is prevalent, or otherwise such infested veld should be fenced in if possible. In good seasons animals will not eat the shrub so readily. Gousiekte veld may be utilized during winter months when the plant is frosted. If possible, grazing infested with the gousiektebossie should be utilized for the growing of crops. If ploughed up repeatedly, the plant will eventually disappear.

At present, there is no remedy against the disease, as the nature of the poison is still unknown and the heart of any affected animal becomes so weak and death occurs so suddenly that no cure is possible. Sick animals should be kept quiet and given good feed.

Every farmer should endeavour to rid his veld of this poisonous plant. Information concerning the eradication of poisonous plants and weeds is obtainable from the Chief, Division of Soil and Veld Conservation, Pretoria.

Nursery Quarantines.

The following nursery quarantines were in force on 1 December, 1943:—

Beaulieu Nurseries, Forestdale Siding, P.B. Grahamstown, C.P., on citrus (all) for red scale.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Deel 23 JANUARY 1944 No. 257

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* Price Review for November 1943.

SLAUGHTER CATTLE.—On the whole reasonable supplies were present on the Johannesburg market, and especially good quality animals were well represented towards the end of the month. Prices also declined during the second half of the month so that prices for November averaged somewhat lower than for October. Ordinary primes on the Johannesburg market were 81s. per 100 lb. estimated dressed weight *on the hoof* as against 81s. 11d. for October; good mediums 75s. 5d. as against 77s. 10d. and compounds 63s. 10d. as against 65s. 8d. per 100 lb. for October. Supplies on the Durban market were still inadequate and were regularly supplemented with supplies of chilled meat made available by the Controller of Foodstuffs. On the whole, maximum prices were obtained.

Slaughter Sheep.—Supplies were reasonable and consisted mostly of medium and inferior classes, while primes were scarce. On the Johannesburg market, prices were in general somewhat higher than for the previous month. On the other markets prices remained more or less unchanged.

Hay.—Larger offerings, especially of Cape lucerne as well as oat hay were on the markets. In many cases the quality lucerne hay left much to be desired, probably as a result of the wet weather. Cape lucerne on the Johannesburg market dropped from 6s. 2d. per 100 lb. to 4s. 9d. for November; and oat hay from 6s. 4d. to 5s. 4d. per 100 lb.

Potatoes.—With a decrease in lowveld consignments, while practically no highveld potatoes had as yet been consigned, supplies were exceptionally small and especially locally produced potatoes of a good quality realized exceptionally high prices. Offerings National Mark potatoes were much less. Transvaal No. 1 on the Johannesburg market were 17s. 3d. per bag for November as against 10s. 10d. for October, while National Mark grade 1, Nos. 2 and 3 rose from 18s. 10d. and 18s. 1d. respectively for October to 22s. 10d. and 22s. 4d. for November. On the Durban market consignments O.F.S.

* All prices mentioned are average.

potatoes decreased considerably and offerings consisted mostly of Natal potatoes. With the smaller supply prices rose very sharply, e.g., in the case of Natal No. 1 from 18s. 10d. per bag for October to 23s. 10d. for November. On the Cape Town market, however, a price decline set in, especially as regards O.F.S. consignments for which the demand was very weak and prices low. Cape No. 1 dropped from 21s. 3d. per bag to 17s. 2d. for November.

Onions.—The Cape season has practically come to a close, with the result that offerings were very scanty at the beginning of the month. Towards the end, however, larger supplies Transvaal and local onions came on the markets and prices declined.

Tomatoes.—Heavy supplies of tomatoes of which a good percentage were of inferior quality reached the markets and prices as a result generally dropped. The demand, however, was good. Most consignments were from the Transvaal. National Mark No. 1 on the Johannesburg market declined from 8s. 3d. to 4s. per tray in November and ordinary tomatoes from 4s. 2d. to 2s. per tray. On the Cape Town market tomatoes fell from 4s. 4d. to 2s. 10d. per tray and on the Durban market from 2s. 3d. to 1s. 1d. per tray for November.

Vegetables.—There was a bigger supply of locally produced vegetables and a decrease in consignments from the Transvaal lowveld. Prices in general tended towards lower levels except in the case of green peas and cabbage, which on the whole were scarce and dear.

Fruit.—Deciduous fruit was still scarce but towards the end of the month moderate quantities of apricots, plums and peaches came on the markets, which were disposed of briskly. Offerings of oranges decreased. The quality was also poorer owing to the fact that the citrus season is at its close. The demand, however, was generally good. Moderate supplies of tropical fruits were offered consisting mostly of pawpaws, pineapples and granadillas, while small quantities of avocado pears and mangoes appeared on the markets. Towards the end of the month bigger supplies of watermelons and spanspeks were also offered for sale and sold briskly.

Eggs and Poultry.—Supplies of eggs decreased and prices in general advanced somewhat. Fresh eggs on the Johannesburg market were 1s. 4d. per dozen and new laid 1s. 8d. On the Durban market new laid averaged 1s. 9d. per dozen. Larger supplies of fowls caused prices everywhere to decline to some extent. Turkeys, however, were scarcer and dearer.

Index of Field Crops and Animal Products.

This index, as is shown elsewhere in this issue, declined somewhat for November, 1943, viz., to 155 as against 157 for October. Price declines of importance occurred in the group Hay, viz., from 161 to 127 and in the case of dairy produce, viz., from 181 to 144 for November. The latter is a seasonal decline. As from 1st November, 1943, summer prices are again paid to producers for dairy products. For full particulars in this connection see the December, 1943, issue of Crops and Markets.

Advances occurred in the group "Other Field Crops" (i.e., Potatoes, Sweet Potatoes, Onions and Dry Beans), viz., from 189 to 208 mainly as a result of the increase in prices of potatoes; and in the group "Poultry and Poultry Produce", viz., from 169 to 171 for November, caused through the rise in the price of eggs.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON. 1st July to 30th June.	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products (e)	Dairy Products (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39	92	107	96	89	79	102	106	92	93
1939-40	86	107	77	95	115	105	106	89	103
1940-41	109	113	106	156	102	108	110	104	108
1941-42	121	134	143	203	102	131	134	145	123
1942-43	160	149	144	159	122	147	167	173	146
1942—									
July	159	143	187	184	122	166	154	173	146
August	159	143	185	175	121	166	155	137	143
September	159	142	186	191	121	166	175	141	147
October	160	143	160	233	121	166	182	149	150
November	160	152	137	192	121	138	187	155	149
December	160	152	126	141	121	138	178	168	147
1943—									
Januarie	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	152	127	208	122	144	197	171	155

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, Sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Potatoes and Onions on Municipal Markets.

SEASON (1st July to 30th June)	POTATOES (150 lb.).						ONIONS (120 lb.).		
	Johannesburg.				Cape Town.	Durban.	Johannesburg.	Johannesburg.	Cape Town.
	Transvaal. No. 1.	Transvaal. No. 2.	N.M. Grade 1. No. 2.	N.M. Grade 1. No. 3.	Cape No. 1.	Natal No. 1.	Transvaal.	Cape.	Cape.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 3	8 10	8 3	8 10	7 4
1940-41	14 2	13 4	18 6	18 5	15 7	16 10	12 5	12 3	9 10
1941-42	19 3	18 7	24 9	25 4	20 1	23 3	10 5	13 11	10 4
1942-43	13 7	12 6	15 8	15 11	15 0	16 9	13 8	14 0	12 6
1942—									
January	18 8	16 4	20 6	18 11	15 5	23 2	9 3	10 2	7 10
February	15 9	13 11	20 11	20 5	16 3	30 3	9 10	9 9	7 0
March	16 6	15 2	21 4	21 7	18 4	21 3	8 9	9 5	6 7
April	14 6	13 4	21 1	21 2	19 9	18 2	11 9	12 10	7 6
May	15 11	16 1	21 7	21 11	20 2	18 7	11 9	12 10	10 10
June	17 10	17 6	22 3	22 10	17 10	20 4	14 0	14 6	11 7
July	17 0	17 1	21 0	22 3	19 6	19 6	13 7	14 10	12 10
August	14 7	14 10	21 4	22 6	18 4	20 8	15 2	15 4	12 11
September	15 1	16 9	23 5	23 9	20 0	20 5	21 2	20 7	18 10
October	21 3	19 0	24 6	24 4	22 10	24 11	17 10	20 0	25 11
November	16 1	15 11	18 3	18 8	18 10	21 4	11 11	—	17 10
December	11 6	9 6	14 1	13 3	12 2	15 6	9 3	10 11	11 9
1943—									
January	7 9	6 8	10 9	10 8	10 9	14 2	8 5	9 4	7 8
February	8 3	7 2	11 8	11 6	8 4	13 7	7 10	10 9	7 8
March	8 10	8 5	13 1	12 7	8 4	13 9	8 1	11 0	7 3
April	11 5	11 1	15 8	15 0	13 0	14 7	11 6	12 10	9 10
May	12 6	12 2	15 11	15 5	15 6	16 3	16 4	15 8	13 2
June	12 11	14 1	19 9	19 0	14 6	17 9	17 3	17 4	14 3
July	16 4	15 11	21 5	21 4	18 1	18 10	17 9	20 2	16 5
August	13 5	12 5	21 3	21 7	19 0	16 3	17 8	23 3	21 4
September	10 5	11 3	19 3	19 10	20 0	17 11	26 6	26 8	24 9
October	10 10	10 11	18 10	18 1	21 3	18 10	19 4	24 10	24 5
November	17 3	15 10	22 10	22 4	17 2	23 10	16 5	—	19 7

Average Prices of Slaughter Cattle and Pigs.

Season (1st June to 31st May).	Beef per 100 lb. (a) Johannesburg. N.M. Prime.	Ordinary Prime.	Good Medium.	Com-pounds.	(b) Durban. Medium.	Com-pound.	Pigs per lb. Live Weight. Johannesburg. Porkers, Prime.	Baconers, Prime.	Stores.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	d.	d.	d.
1938-39	41 9	39 0	36 3	31 7	33 0	27 4	5·3	6·2	4·9
1940-41	43 11	41 4	37 11	32 5	31 1	25 4	4·5	5·4	4·0
1941-42	55 5	52 0	47 4	38 4	40 3	30 9	5·1	6·6	4·5
1942-43	67 4	63 2	57 9	46 1	45 6	35 9	7·2	8·6	6·9
1942—									
January	62 3	59 6	54 1	43 5	45 1	29 3	5·6	7·0	5·6
February	58 3	53 4	49 2	40 6	38 11	26 7	5·4	8·0	5·2
March	53 5	47 10	44 3	36 11	37 8	27 11	5·5	8·2	4·8
April	53 0	49 10	44 4	35 6	37 3	28 5	5·5	8·2	4·7
May	54 4	51 3	47 5	36 8	35 11	26 0	5·0	7·8	4·6
June	56 6	53 8	49 8	39 5	37 1	28 6	5·5	8·0	5·1
July	61 0	57 8	53 6	44 3	46 10	33 10	6·4	8·4	6·1
August	62 5	59 2	53 2	43 2	45 3	31 9	6·6	8·6	6·0
September	69 9	65 4	60 3	49 2	53 8	41 3	6·8	8·5	6·4
October	75 1	71 3	65 6	51 2	50 2	39 10	7·7	8·3	7·5
November	83 8	78 2	69 0	52 2	47 6(c)	38 7(c)	8·3	8·6	8·2
December	74 3	69 4	64 3	51 1	51 11	35 11	8·3	8·5	7·0
1943—									
January	67 5	62 10	57 2	47 10	45 6	37 0	7·8	8·4	8·4
February	64 1	60 11	55 8	44 5	43 11	34 6	7·4	8·8	8·0
March	63 8	59 2	54 4	43 4	41 0	34 1	6·8	8·8	6·2
April	65 6	60 8	55 8	43 4	42 1	33 11	6·9	9·1	6·5
May	65 0	59 11	55 3	43 0	42 6	37 6	7·6	8·7	6·6
June (d)	36 3	32 7	29 7	23 1	42 6	37 0	8·3	8·7	7·4
		No. 1.	No. 2.	No. 4.					
July (d)	40 9	37 5	34 6	27 6	45 6	41 0	8·4	8·6	7·1
August	75 8	70 8	65 3	56 0	49 0	44 0	8·4	8·7	7·2
September	81 6	76 11	72 10	65 8	49 0	44 0	7·7	8·9	7·4
October	88 0	81 11	77 10	65 8	49 0	44 0	7·7	8·8	7·8
November	85 3	81 0	75 5	63 10	49 0	44 0	7·7	8·4	7·5

(a) Estimated dressed weight of cattle as sold on the hoof. As reported by Meat Control Board.
(b) Dressed weight of carcase sold on the hook.
(c) Grade 3 and undergrade respectively according to new price reporting basis of Durban meat prices since November, 1942. With the new basis Grade 1 corresponds approximately with ordinary primes; grade 2 with good mediums; grade 3 with mediums and undergrade with compounds and inferiors.
(d) For June and July, 1943, prices were quoted per 100 lb. live weight.

Average Prices of Sheep per lb. Estimated Dressed Weight.*

Season (1st June to 31st May).	Johannesburg. Merino Wethers. Prime.	Medium.	Persians and Cross Breds. Prime.	Medium.	Cape Town. Merinos. Prime.	Medium.	Capes and Persians. Prime.	Medium
	d.	d.	d.	d.	d.	d.	d.	d.
1938-39	6·3	5·5	5·8	5·1	5·8	5·6	5·9	5·7
1940-41	6·7	6·1	6·2	5·7	6·1	5·8	6·3	6·0
1941-42	8·3	7·4	7·5	6·8	7·7	7·2	7·6	7·3
1942-43	11·5	9·8	9·8	8·3	10·7	9·8	10·5	9·6
1942—								
January	8·7	7·8	7·5	6·7	7·4	7·1	7·4	7·2
February	9·3	8·3	8·2	7·7	9·0	8·3	8·7	8·3
March	9·6	814	8·8	7·9	9·6	8·8	9·3	8·8
April	8·8	7·7	7·9	6·9	9·7	8·8	9·4	8·8
May	9·1	7·9	8·1	6·9	9·0	8·3	9·0	8·4
June	9·7	8·2	8·6	7·3	9·4	8·8	9·6	8·7
July	10·3	8·9	9·4	8·0	9·9	9·2	9·9	9·2
August	11·1	9·3	10·0	8·5	10·6	9·7	10·3	9·5
September	12·1	10·5	10·9	9·2	10·1	9·6	10·4	9·4
October	12·4	10·7	11·4	10·1	10·7	9·3	10·3	9·4
November	12·9	11·0	11·6	9·7	10·5	9·9	10·4	9·6
December	12·3	10·2	10·3	8·7	10·9	10·2	10·8	10·0
1943—								
January	11·2	9·4	9·5	8·3	10·8	9·5	10·4	9·4
February	10·5	8·6	8·2	6·5	10·1	9·3	10·1	9·1
March	11·5	9·8	9·0	7·3	11·7	10·6	11·1	10·2
April	12·0	10·2	9·5	7·7	12·4	10·9	11·6	10·8
May	12·0	10·3	9·6†	7·9†	11·1	10·1	11·1	10·3
June	11·4	10·2	10·4	9·2	10·8	10·5	11·0	10·2
July	11·4	10·3	10·3	9·3	11·4	10·2	11·2	9·9
August	11·8	10·2	10·8	9·3	12·4	11·6	12·2	11·1
September	12·8	10·9	12·0	9·7	12·0	11·2	12·0	10·9
October	11·5	9·6	10·1	8·0	11·3	10·5	11·2	10·3
November	11·9	10·1	10·6	8·7	10·9	10·3	11·1	10·4

* As sold on the hoof. Reported by Meat Control Board.
† As from June "other hamels".

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1st July to 30th June).	CABAGES (Bag). (a)			CAULIFLOWER (Bag). (a)			TOMATOES (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d'	s. d.	s. d.	s. d.
1938-39.........	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940-41.........	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941-42.........	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-43.........	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1942—										
January.......	7 7	5 4	9 1	8 1	4 0	—	2 11	1 0	1 6	2 1
February......	8 0	6 3	18 3	5 10	—	—	3 6	1 7	1 5	1 5
March.........	7 3	6 0	22 9	5 6	8 0	—	5 8	2 7	1 3	2 6
April:	8 2	4 9	16 3	6 4	5 8	12 6	5 4	2 6	1 8	1 11
May...........	7 7	3 9	10 0	6 2	5 0	11 5	3 11	2 4	2 10	1 7
June..........	6 11	3 2	7 10	6 10	5 2	7 11	2 8	1 5	2 5	1 4
July..........	7 7	4 5	6 11	6 3	5 2	6 2	2 3	1 3	1 11	1 1
August........	6 0	4 7	3 11	3 8	5 11	5 1	2 5	1 3	1 7	0 7
September.....	5 9	4 11	2 9	3 11	6 4	6 7	2 5	1 3	1 9	0 9
October........	4 2	6 10	2 5	—	4 9	5 5	2 6	1 5	2 0	1 4
November.....	3 3	6 7	2 4	—	7 4	11 0	3 6	2 0	2 8	1 10
December......	3 11	7 10	3 2	—	4 0	—	3 8	1 10	3 0	2 4
1943—										
January.......	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February......	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March.........	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April.........	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May..........	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June..........	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July..........	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August........	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September.....	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October........	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November.....	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages: Johannesburg, 105 lb., Cape Town 105 lb., and Durban 90 lb. For cauliflower: Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Oranges and Pawpaws

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	N.M. Navels.	Other. Navels.	Other. Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940-41.........	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1941-42.........	1 9	1 8	2 6	1 10	2 5	1 11	2 1	2 1	1 10
1942-43.........	2 4	2 6	3 1	1 11	3 9	2 8	2 11	2 7	2 1
1942—									
January.......	—	2 6	3 8	2 10	4 7	—	3 11	3 3	2 1
February......	—	3 11	4 5	4 7	6 10	3 9	5 8	6 4	3 3
March.........	—	3 7	2 11	6 6	5 10	4 3	5 6	4 1	3 1
April.........	2 1	2 0	1 10	3 4	5 0	3 4	2 6	4 0	3 1
May...........	2 4	2 3	2 1	2 3	2 3	2 6	1 2	3 8	3 1
June..........	2 3	2 3	1 9	2 1	—	2 6	1 11	2 11	2 5
July..........	2 5	2 5	1 11	2 1	—	2 8	1 0	2 8	2 2
August........	2 11	2 8	2 3	3 0	2 4	3 6	2 4	2 2	1 8
September.....	2 5	3 3	2 3	3 4	2 2	4 0	2 6	2 1	1 6
October........	2 9	2 11	2 7	5 1	3 1	3 7	2 11	2 4	1 9
November.....	—	3 6	4 0	6 11	3 7	4 6	3 6	3 1	2 6
December......	—	3 1	3 8	2 11	4 3	—	4 2	3 5	2 1
1943—									
January.......	2 0	3 8	4 0	—	4 10	2 4	3 9	3 9	2 0
February......	7 1	5 8	5 3	—	7 6	—	4 9	4 11	3 6
March.........	5 11	5 4	4 1	6 6	8 6	3 3	5 8	5 2	3 9
April.........	3 4	2 11	2 10	5 3	4 9	3 3	4 0	4 4	3 3
May...........	2 6	2 4	2 0	2 8	2 0	2 4	—	4 1	2 11
June..........	2 6	2 4	1 9	2 6	—	2 7	—	3 9	2 9
July..........	—	2 5	1 9	2 5	—	2 6	2 5	3 2	2 4
August........	—	2 6	1 11	—	—	2 6	2 5	3 4	2 1
	Gr. I.	Gr. II	Gr. II						
September.....	3 1	2 10	2 2	—	—	2 7	2 6	3 3	2 4
October........	2 7	2 4	2 3	—	—	—	2 5	3 0	2 5
November.....	—	—	—	—	—	—	2 6	2 8	1 11

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.).			Green Peas (Pocket 20 lb.).			Carrots (Bag). (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942-43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1942—									
January	2 4	0 8	3 1	6 4	—	4 8	5 9	7 8	11 6
February	2 1	1 4	1 7	2 6	—	2 7	10 0	11 6	19 1
March	1 10	2 1	2 2	3 2	2 0	3 6	12 11	10 6	24 7
April	1 6	3 0	1 5	3 3	5 0	2 10	13 5	9 7	29 7
May	2 6	3 3	1 10	4 9	3 8	2 9	9 2	9 8	19 10
June	3 7	2 10	2 4	4 6	6 11	2 10	5 5	11 0	13 2
July	3 5	3 8	4 0	2 6	3 3	2 5	5 7	12 5	11 10
August	3 4	3 10	2 5	2 1	2 7	1 7	4 7	13 4	11 0
September	3 3	4 9	3 2	1 11	3 0	2 3	2 8	10 0	8 3
October	3 0	5 10	1 10	2 4	2 7	2 11	2 11	7 3	4 5
November	2 2	3 2	1 7	2 2	2 0	2 5	3 10	6 7	6 1
December	2 3	2 8	3 3	2 7	4 9	5 3	3 4	6 8	6 10
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	10 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 11	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Maize, Kaffir-corn and Dry Beans per 200 lb.

Season and Month.	Maize. F.o.r. Producers' Stations. No. 2.		No. 6.		Maize. Cape Town Consumers' Price F.o.r. No. 6 in Bags.	Kaffircorn F.o.r. Producers' Stations.		Dry Beans Johannesburg (Municipal Market).	
	Bags.	Ex Elevator.	Bags.	Ex Elevator.		Bags, K. 1.	Bags, K. 2.	Speckled Sugar.	Cow Peas
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	8 7	8 6	8 6	8 8	13 2	13 1	12 9	25 0	16 9
1940-41	9 2	8 8	9 3	8 9	14 0	15 6	17 0	30 0	16 8
1941-42	10 10	9 10	10 4	8 11	14 3	18 10	19 6	32 10	19 8
1942-43	15 1	—	15 1	—	18 1	24 10	24 10	34 0	25 8
1942—									
January	11 0	10 1	10 10	9 4	14 9	21 5	22 3	34 4	21 9
February	11 0	—	11 0	—	14 8	21 11	22 11	32 7	20 11
March	10 6	—	10 6	—	14 9	20 2	21 1	30 10	19 2
April	10 6	—	10 6	—	14 10	18 5	18 9	32 6	25 5
May	15 0	—	15 0	—	15 6	20 8	20 8	32 8	26 4
June	15 0	—	15 0	—	17 6	21 11	21 11	33 5	26 5
July	15 0	—	15 0	—	17 7	21 8	21 8	33 7	24 8
August	15 0	—	15 0	—	17 8	22 10	22 10	36 7	27 2
September	15 0	—	15 0	—	17 7	24 6	24 6	38 1	28 4
October	15 0	—	15 0	—	17 9	24 8	24 8	39 0	27 6
November	15 0	—	15 0	—	17 10	25 0	25 0	38 6	27 1
December	15 0	—	15 0	—	17 11½	25 0	25 0	37 3	22 7
1943—									
January	15 0	—	15 0	—	18 6	27 3	27 3	33 7	21 4
February	15 0	—	15 0	—	19 2	34 2	34 2	30 1	22 8
March	15 0	—	15 0	—	19 6	29 6	29 6	34 8	26 3
April	15 0	—	15 0	—	—	21 7	21 9	35 7	27 1
May	16 0	15 3	16 0	15 3	—	21 8	21 8	41 6	28 3
June	16 0	15 3	16 0	15 3	19 3	21 4	22 1	42 1	28 7
July	16 0	15 3	16 0	15 3	19 3	24 6	25 6	46 9	29 9
August	16 0	15 3	16 0	15 3	19 3	24 7	25 5	53 11	33 0
September	16 0	15 3	16 0	15 3	19 3	23 8	24 4	55 6	34 6
October	16 0	15 3	16 0	15 3	18 11	22 9	23 9	54 7	33 8
November	16 0	15 3	16 0	15 3	19 0	21 9	22 6	53 1	34 5

Seasonal year for maize and kaffircorn, 1st June–31st May; for dry beans, 1st April–31st March.

Average Prices of Lucerne and Teff Hay and Certain Meals for Feeding.

Season (1st July–30st June).	Lucerne (100 lb.). Johannesburg (a). Cape	Lucerne (100 lb.). Johannesburg (a). Transvaal	Lucerne (100 lb.). Cape Town, Cape 1st Grade.	Teff Johannesburg. (a) (100 lb.),	Meals for Feeding: F.o.r. Johannesburg. Lucerne. (100 lb.).	Monkey Nut Cake (200 lb.).	Oats, Sussex Ground (150 lb.).	Bone, 24·8% Protein (100 lb.).	Mixed, 26·4% Protein (100 lb.). (b)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 11	3 1	4 0	2 7	6 9	15 2	15 4	8 5	8 0
1940–41	4 2	3 5	4 3	3 3	6 7	15 3	14 8	11 2	8 7
1941–42	5 7	5 2	5 8	4 7	8 4	—	17 5	10 11	10 10
1942—									
January	4 10	4 7	5 1	4 11	7 6	5 6	17 6	10 6	10 3
February	4 11	4 8	5 5	4 4	7 6	4 11	17 6	10 6	10 3
June	8 1	7 7	7 9	7 4	9 6	—	18 0	11 0	11 0
July	7 3	6 4	7 10	6 1	9 6	5 6	18 0	4 11	11 0
August	7 4	6 4	7 10	5 5	9 6	6 4	18 0	5 6	11 6
September	7 5	6 3	7 5	5 3	9 6	8 6	18 0	—	11 6
October	6 3	6 7	7 1	5 0	9 6	9 6	18 0	—	11 6
November	5 1	4 0	6 4	5 5	9 6	—	18 0	—	13 6
December	4 11	4 5	7 1	3 11	9 6	—	18 0	—	13 6
1943—									13 6
January	5 0	4 5	7 3	5 5	9 6	—	18 0	—	13 6
February	5 0	6 6	7 2	5 0	9 6	—	18 0	—	13 6
March	5 6	5 3	7 3	5 4	—	—	—	—	14 6
April	5 6	—	7 5	5 3	—	—	—	—	14 6
May	5 7	—	7 5	5 4	—	—	—	—	14 6
June	6 7	6 9	7 5	5 5	—	—	—	—	14 6
July	6 11	6 6	7 9	5 8	—	—	—	—	17 3
August	7 0	6 6	7 9	5 8	—	—	—	—	17 3
September	7 4	6 8	7 9	5 7	—	—	—	—	17 3
October	6 2	5 7	7 4	5 6	—	—	—	—	17 3
November	4 9	4 7	6 9	4 11	—	—	—	—	17 3

(a) Municipal Market. (b) Approximately half of the protein is claimed to be animal protein. (c) Per ⌐50 lb

Average Prices of Apples, Pears and Grapes on Municipal Markets.

Season (1st July to 30th June).	Apples (Bushel box). Johannesburg. O'henimuri.	Apples. Johannesburg. White Winter Pearmain.	Apples. Johannesburg. Wemmershoek.	Apples. Cape Town. O'henimuri.	Apples. Cape Town. White Winter Pearmain.	Apples. Cape Town. Wemmershoek.	Pears (Bushel box). Johannesburg. N.M. No. 1	Pears. Johannesburg. Other.	Grapes (Tray). Johannesburg. Johannesburg.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41	8 4	7 1	6 4	8 11	10 8	5	8 11	6 3	1 8
1941–42	8 11	7 11	7 3	9 1	10 9	6 9	7 3	8 0	1 11
1942–43	14 9	11 6	9 1	10 8	12 11	6 11	—	10 8	1 10
1942—									
January	—	—	—	—	—	—	—	7 5	3 2
February	8 3	—	12 2	8 10	—	—	7 3	7 8	1 6
March	7 5	6 11	7 6	7 7	9 3	6 3	5 6	7 0	1 10
April	8 6	7 6	6 8	7 9	9 8	6 2	—	9 6	1 11
May	8 10	7 7	6 5	8 9	9 7	5 6	—	8 11	2 0
June	10 1	8 10	8 4	8 7	10 9	6 3	—	15 9	2 5
July	11 2	11 4	8 1	10 10	12 1	8 11	—	—	0 10
August	17 6	15 8	10 6	11 7	11 8	9 10	—	—	—
September	16 4	16 3	7 0	11 11	11 3	—	—	—	—
October	16 6	16 3	—	9 11	9 4	—	—	—	—
November	20 8	18 6	—	10 4	7 2	—	—	—	—
December	19 7	17 8	—	11 10	17 5	—	—	14 10	3 8
1943—									
January	—	17 5	—	11 5	—	—	—	9 3	2 3
February	10 1	11 0	14 4	8 11	9 0	4 11	—	9 10	1 5
March	8 5	10 1	8 10	9 2	11 8	5 9	—	10 0	2 0
April	13 10	10 6	11 7	10 4	12 2	6 11	—	12 8	2 2
May	16 8	11 11	12 5	12 0	13 0	8 0	—	14 8	2 9
June	18 3	17 1	12 8	14 1	16 5	13 1	—	—	3 4
July	17 3	19 7	—	12 6	17 2	14 0	—	—	—
August	19 5	18 10	13 3	13 10	17 9	—	—	—	8 5
September	19 5	21 10	11 4	12 6	19 1	7 7	—	—	15 0
October	25 3	26 0	—	12 1	15 0	—	—	—	—
November	27 3	29 7	—	11 7	12 8	—	—	—	—

Average Prices of Eggs and Poultry on Municipal Markets.

Season. (1st July to 30th June.)	Eggs. Johannesburg, New Laid, Per Dozen.	Eggs. Durban, New Laid, Per Dozen.	Eggs. Cape Town. Per 100	Fowls (Live, each). Johannesburg.	Fowls (Live, each). Durban.	Fowls (Live, each). Cape Town.	Turkeys (Live, each). Johannesburg.	Turkeys (Live, each). Durban.	Turkeys (Live, each). Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939–40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940–41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941–42	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942–43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1942—									
January	1 7	2 0	12 2	3 3	3 5	3 6	14 1	15 9	11 5
February	1 9	2 0	13 1	2 10	3 2	3 3	13 3	13 3	12 1
March	2 0	2 6	14 5	3 0	3 5	3 2	11 4	13 5	13 5
April	2 3	2 10	17 1	2 10	3 4	2 11	11 1	12 2	14 5
May	2 6	2 10	18 11	3 5	3 7	3 1	12 4	13 5	13 7
June	2 6	2 10	22 7	3 9	3 6	3 7	13 8	13 10	14 6
July	1 8	2 0	15 1	4 6	3 8	4 1	15 0	12 2	15 0
August	1 2	1 2	10 11	4 7	3 9	4 11	17 5	14 7	18 4
September	1 2	1 4	10 4	5 0	3 10	5 2	16 0	17 8	19 4
October	1 4	1 5	11 2	5 4	3 11	5 5	18 9	17 11	14 3
November	1 5	1 7	12 2	4 8	4 2	5 7	17 7	19 2	18 0
December	1 8	2 0	13 1	4 7	4 2	4 11	19 8	22 0	17 10
1943—									
January	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (a)	Fertilizers. (b)	Fuel. (c)	Bags. (d)	Feeding Stuffs. (e)	Fencing Material. (f)	Dipping and Spraying Material. (g)	Building Material. (h)
Base—								
1936–38	100	100	100	100	100	100	100	100
1939	105	106	98	146	90	114	100	103
1940	120	139	117	171	95	176	112	124
1941	124	170	124	175	109	208	115	144
1942—								
January	121	146	125	188	115	229	117	164
April	122	146	134	194	127	228	117	165
July	124	146	146	220	147	231	118	167
October	124	146	152	224	145	230	118	171
1943—								
January	126	146	154	232	145	238	123	174
April (j)	126	146	154	233	151	238	123	176
July	126	146	156	235	159	239	131	179
October	135	146	156	249	156	240	131	181

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

(a) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, sgares, land sides, mouldboards, knife, pitman, guard.
(b) Superphosphate, ammonium sulphate, potash, muriate, bonemeal.
(c) Petrol, power paraffin, crude oil, grease, lubricating oil.
(d) Woolpacks, grain bags, sail twine, binder twine.
(e) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.
(f) Fencing wire, standards, baling wire.
(g) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
(h) Corrugated iron, deals, cement, lime, flooring boards.
(j) Preliminary.

G.P.-S.7470—1943-4—200.

The Late Col.-Comdt. W. R. Collins, D.T.D., D.S.O.

WITH the passing of William Richard Collins, South Africa has lost another of the few survivors of that notable band of old-timers.

In him were embodied those qualities of fearlessness and resolution and, above all, of integrity and lovableness which the stalwarts of the 1899-1902 war period left as a valuable tradition and glorious heritage to later generations. South Africa's national life has been enriched by this important link between the present and the past.

In paying this last tribute to his memory, we do not think of his colourful career as soldier or as politician. We think of him, in the first place, as Minister of Agriculture in relation to those of us who, as Public Servants, have for more than five years had the privilege of serving under him. Those of us who worked in close association with him, can bear witness to the unswerving loyalty with which he devoted himself to his difficult task. We can testify to his humanity and humility towards us and towards all with whom he came into contact. Indeed, as a Minister he never lost his human outlook. We can testify, too, to his sincerity and uprightness. In him we have lost a staunch and steadfast friend.

In the second place, we call to mind the services which he has rendered to the farming community. He had been Minister of Agriculture for hardly a year when he was called upon to take upon his shoulders the responsible task of steering the great agricultural industry through the abnormal and troublous period of war. Unassumingly, but with unflagging devotion, he focussed all his energies upon that task, and in the performance of that task he died—in harness.

To all of us his sudden passing came as a severe shock. To his widow and next-of-kin, to whom the loss is even much greater than to us and the farming community, we wish to convey our deepest sympathy. As with them, his memory will continue to live with us.

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[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

The Agricultural Industry after Four Years of War.

Report of the Department of Agriculture and Forestry and of the Food Control Organization for the year ended 31 August, 1943.

By Dr. P. R. Viljoen, Secretary for Agriculture and Forestry and Deputy-Controller of Food Supplies.

AS is usually the case in South Africa's most extensive and widely-ramified industry, viz., agriculture, a large number of events are witnessed in the course of a year—events which are of the greatest significance to those concerned with the industry. These events have their origin in various factors. To begin with, farming constitutes an integral part of life; as an industry, it is dynamic in nature and must inexorably either progress or retrogress. Out

The Department wishes to express its regret that it could not, as in previous years, publish its Annual Report in the December issue of "Farming in South Afraca". This unfortunate delay is due to the fact that the Department had to devote all its attention to the compilation of the report on the Reconstruction of Agriculture (which, it is hoped, will also be published at an early date), during the period when the Annual Report had to be prepared for publication. It must also be pointed out that the Report covers the period 1 September, 1942 to 31 August, 1943, and that, with a few exceptions here and there, the data con-covers the period 1 September 1942 to 31 August 1943 and tained in the report do not extend beyond that period.

of this continuous process of development events are born which exercise a pronounced effect on the industry. No matter how intangible and inviolable the continuity of this process, however, alternating peak points and depressions will invariably occur—developments and events which must be regarded as special features of any given period. Like all other years, the past year, too, has witnessed some notable events in the sphere of agriculture.

Moreover, agriculture is pre-eminently the industry of nature, and the vagaries of nature, which in this country are so pronounced, must be accorded a place in our interpretation of events.

Finally, we come to the influence of the war. The greatest war ever known in the history of the world has already been raging for four years. During the first year or two, the war did no more than touch the surface of our economic life. Gradually, the effects penetrated deeper and assumed larger proportions, until to-day they have made an imprint on practically every phase of society. The agricultural industry has also been deeply affected in its manifold phases. Indeed, there is hardly an aspect of agriculture where the

effects are not perceptible and, although the events of the past year in the Union's agricultural world have in no wise always been of an unfavourable or undermining nature, they must be viewed largely in the light of the war and against the changed background produced by this all-pervading factor. The war has occasioned considerable dislocation in our agricultural economy; in more respects than one it has brought about a reversal in the trend of development; it has created new agricultural problems, while at the same time solving some temporarily at least—and we are now confronted with a post-war task of readjustment and reconstruction, which will call for the exertion of every ounce of our strength and energy.

Climatic Conditions.

In so far as climatic conditions are concerned, it must be stated that in the winter-rainfall area rain did not fall until late in the season, when heavy precipitations were experienced in a relatively short period, resulting in the leaching of arable lands. The result was a smaller grain crop than usual. The weather remained unsettled practically throughout the season, and, in addition, the winter-rainfall area experienced its second consecutive drought at the commencement of the winter sowing season. The deleterious effects of this may be reflected in an unfavourable wheat crop for 1943/44 in certain south-western districts of the Cape Province. In parts of the Little Karroo the drought was so severe that the State found it necessary towards the end of August to institute a relief scheme for the provision of maize for stock-feeding purposes.

In so far as the summer-rainfall area is concerned, natural conditions were, on the whole, relatively favourable, if variable. The season commenced with good spring rains, as a result of which winter crops made good progress in the northern provinces, and the Orange Free State actually produced a record wheat crop. In most areas abundant rains continued to fall until late in summer, and although, on the one hand, these rains retarded and interfered with the harvesting of wheat, they were on the other hand extremely favourable for maize-sowing operations. Consequently, a very large area was planted to maize, and as late as the end of January a record maize crop was still expected. A sudden drought, however, coupled with intense heat during February, resulted in the loss of several million bags of maize and, in addition, harvesting operations were seriously held up later on by exceptionally heavy winter rains. Moreover, the copious rains experienced during summer caused the veld to reach maturity very rapidly, and this, in conjunction with the winter rains, led to a considerable decline in its nutritive value. Consequently, although stock were in good condition during summer, their condition deteriorated appreciably during winter, and with the advent of heavy, cold rains at the beginning of Spring, serious stock losses occurred. If to this we add the fact that the serious maize shortage consequent upon the small crop of 1942 rendered it absolutely impossible for maize to be made available for stock-feeding purposes, it will be evident that the animal-husbandry industries, more particularly the dairying, poultry and pig industries, did not experience favourable conditions during the past year in so far as production is concerned.

Nevertheless, from the climatic point of view, the past year was, on the whole, not unfavourable, and was, at any rate, better than the previous year when a very severe drought prevailed.

The General Supply Position.

Supplies are inseparably bound up with climatic conditions and, consequently, it is essential to draw a picture of the natural conditions which form the background, before proceeding to a review of the methods employed for safeguarding the food position, i.e., a discussion of the most important activities of the year, namely, the activities of the Food Control Organization.

In last year's report mention was made of the sudden revolution in our agricultural economy, as a result of the decrease in production occasioned by the drought, and the enormous increase in consumption—a revolution which caused this country, within the space of a few months, to change from an exporting country into a country where food conservation and production for local use have become the pivot of our farming activities. And if any one characteristic of the past year must be singled out for emphasis, it is that in spite of more favourable climatic conditions in general, the local demand was so exacting that the pressure on supplies assumed even larger proportions. In other words, the surplus problem receded further into the background and our difficulties hinged to a greater extent on the provision, conservation and augmentation of our food products.

For several years before the outbreak of the war and even for a few years afterwards, it was these very surpluses which made the price problem and the remunerativeness of prices in relation to production, one of the most outstanding difficulties in the field of agriculture. During the past eighteen or twenty months, however, a considerable change has been witnessed in this state of affairs, and the centre of gravity of South Africa's principal agricultural problem has rapidly shifted; on the whole—although both are on a considerably higher level—an improvement has undoubtedly been effected between prices and production costs, and, consequently, also in the farmer's net income, so that the emphasis has shifted to the supply position, both as regards the Union's production and the instruments which the country requires to make that production possible.

This does not imply, however, that we are not, or were not, at any stage able to feed the military and civilian population of the country. On the contrary, as will be pointed out later, the population of the Union must be considered among the most fortunate of all the belligerent countries of the world in so far as the provision of food requirements is concerned. Nevertheless, the fact must be recorded that the past year has seen us drift still further away from pre-war position when appreciable quantities of food products were exported. In point of fact, except for citrus and dried fruits, we have not given a thought to export, all our energies having been concentrated on the provision of food for meeting our own needs.

The position was greatly aggravated by the fact that the 1942 maize crop was totally inadequate to meet the country's demands. With a crop of approximately 16,000,000 bags, as against an estimated consumption of 22,000,000 bags, we were confronted with a most complicated problem. The effects of the maize shortage made themselves felt in numerous spheres, and for the first time the key position occupied by maize in the economic life of South Africa was fully brought home to us. Its indispensability as a staple food for the poorer sections of the community, and more particularly for the natives, was once again brought into prominent relief, and its important rôle as a stock feed in the Union's animal-husbandry

industries was irrefutably proved. In fact, we experienced a serious maize crisis which was characterized by the great difficulty experienced in providing for human requirements, and which for a few months left stock-farmers, and more particularly dairy, poultry- and pig-farmers, without maize for feeding purposes. The hampering effect of this upon production was undoubtedly considerable, and we have not yet completely shaken off its consequences. The fact that we ultimately surmounted the problems created by the maize shortage is due practically entirely to the comparatively favourable climatic conditions and the various measures instituted by the Food Controller and the Maize Board.

Another factor hampering production is the shortage of agricultural requisites. In so far as the labour question in agriculture is concerned, farmers were once again confronted with the problem of increasing their production in the face of a serious labour shortage. Fortunately, however, the position was alleviated by the scheme instituted by the Food Controller in co-operation with the Defence Department whereby Italian prisoners of war were placed at the disposal of farmers, not only for general farm labour, but also for assisting on special occasions, as, for example, in the harvesting of the maize crop in certain districts of the maize belt.

Probaby in no respect was South Africa as vulnerable at the outbreak of the war as in the field of agricultural implements and other requisites. Of the large diversity of materials which are indispensable to present-day agricultural production, only an infinitesimal percentage was produced in the Union, and we were dependent on imports for practically all our requirements. In view of the shipping difficulties, this state of affairs placed us in a very difficult position; the importation of agricultural requisites was curtailed to a very large extent, and, in addition, we had hardly any local production facilities to fall back on. Our farmers have been feeling this shortage acutely for several years now, and although it is difficult to vouchsafe an accurate opinion on matters of this nature, this difficulty probably reached its climax during the past year, the total quantity of our available instruments of production having fallen to a dangerously low level. The inevitable result was a hampering of production.

In this respect, too, the Goverment took vigorous action, and while making every effort to import as many implements and other agricultural requisites as were permitted by the limited import facilities, its principal aim was to find a more permanent solution to the problem, namely, by developing industries for the local manufacture of these materials and requisites. The Controller of Agricultural Machinery, Implements and Requisites to whom the execution of this difficult task was entrusted, in co-operation with the Food Controller, other authorities and the industrial interests concerned, has rendered a great service to the country. The first fruits of this policy were picked during the past year, since, had it not been for the Union's own contributions towards the necessary instruments, production would have received a far greater set-back. It may confidently be expected that these industries will fall under the group of industries which wil continue after the war, and that the Union's self-sufficiency in this sphere will gradually be extended.

While, therefore, production was undeniably fraught with numerous difficulties, it does not by any means follow that a food shortage was experienced in the country. On the contrary, the Food

Control Organization assisted by the relatively favourable natural conditions, undoubtedly succeeded in ensuring that our nation, relatively speaking and on the basis of pre-war nutritional standards, was better off than most other belligerent countries. In short, the steps taken to safeguard the country's food position were crowned with success in spite of the colossal difficulties which had to be overcome during a period of emergency. Obviously, this is an achievement of the greatest significance.

These activities of the Food Control Organization for safeguarding our food position have two main aspects. The first is the measures taken to stimulate production with a view to assuring an adequate supply of food in the country, and the second is the benefits which the activities of the Organization procured for consumers, in spite of the criticism expressed by a certain section.

Stimulation of Production.

From the very outset it was fully realized that the principal task of the Food Control Organization is the stimulation of production and the provision of food. Consequently, the Organization, by the institution of various measures, devoted its energies mainly in this important direction.

Mention has already been made of one direction in which it has been helpful in promoting production, namely, that in connection with the provision of agricultural requisites. Apart from the assistance in connection with the supply of materials like implements, bags, wire, binder twine, etc., the measures instituted for the provision of fertilizer and bonemeal were also of paramount importance. Both these requisites became indispensable to agricultural production, one for crop and the other for animal production, and there is little doubt that, had it not been for the constant efforts directed at obtaining supplies and making these available to producers and a system of rationing, there would have been an appreciable decline in the production of crops as well as that of animal products. In addition, the fixed prices for fertilizer and bonemeal were maintained at a relatively reasonable level, so that rises in the prices of these commodities did not force up the production costs of the farmer still further.

Apart from bonemeal, the general question of feed supplies received special attention from the Organization. A Feed Committee was instituted in April 1942 with the object of keeping in constant touch with matters pertaining to feeds, and of effecting improvements. The work performed by this committee was of great value to the stock industry, particularly during the period of maize shortage when, initially, small quantities only, and eventually no maize at all, could be made available for stock-feeding purposes, and alternative feeds had to be found for dairy, pig and poultry farmers. Nor was the importance of importation in regard to the general question of food supplies overlooked. Wherever possible, foodstuffs were imported, as, for example, in the case of wheat and tea. In addition, increased attention was given to new methods of food preservation. Considerable progress was made with the canning and dehydration of a large number of products which had previously, in South Africa at any rate, not yet been subjected to processing. Indeed, this new development promises to be of the utmost importance, not only from the point of view of the present food-supply position, but also with an eye to the future. These methods open up new possibilities for products such as vegetables,

fish, meat, etc.,—possibilities which have not been left unexplored by the Food Control Organization.

The fact remains, however, that we are to a very large extent dependent for our food supplies on the efforts of our own producers. In point of fact, ever since the first World War the agricultural policy of South Africa has been purposefully directed at increasing the self-sufficiency of this country, for the very reason that our vulnerability in this respect was clearly revealed even during the last war. There is little doubt that this aspiration towards self-sufficiency was crowned with success. This constitutes one of the greatest achievements in agriculture during the past 25 years. The new position has necessitated the application of various methods in regard to local production, all of which aim at increased production. It was necesary for the production policy as a whole to be reformulated, so that the greatest emphasis could be placed on those products which, under present-day conditions, are most essential.

This new policy which is adjusted to the war, is prominently brought to the notice of farmers by means of personal contact between field officers and farmers, while full use is also made of the radio and the press. The production campaign is also promoted by various other forms of assistance and enlightenment, including that in connection with seed requirements. The production of potatoes, for example, was maintained by the importation of about 1,250 tons of seed potatoes from Great Britain for supplementing our seed-potato supplies which are so adversely affected every year by degeneration diseases. A large proportion of these and other seed potatoes were planted on Government land for multiplying purposes. Although this step was taken in the interest of farmers themselves, it very unfortunately evoked the unmerited criticism from some that the Government was trying to compete with the farming community. This is by no means the case, the Government's sole aim being to safeguard the food position. Another direction in which the Food Control Organization did valuable work, is in connection with the scheme instituted last year for the conservation of groundnut seed. This scheme ensured the carrying over of sufficient seed for the past season, in consequence of which a good groundnut crop was harvested.

Furthermore, the assistance of the Food Control Organization was not confined to imports, the provision of instruments of production or to improved methods of food conservation. The Organization is also concerned—and in a very pertinent and direct manner—with the pivot around which the farmer's activities revolve, namely, the prices realized by his products.

There was a considerably greater rise in production and other costs than is generally realized, and farmers could hardly be expected to produce adequate supplies without the encouragement held out by commensurate prices for their products. Since the disappearance of the surplus problem the Government has expressed itself clearly in favour of a policy of increased production in agriculture. To this end a price policy has been laid down in respect of agricultural products, which makes provision for the compensation of the primary producer for his additional production and living costs, the partial remedying of the disparity which exists between agricultural and industrial prices, and a special stimulus to the producers of certain essential food products, like, for example, wheat. At the same time the Government has also laid down another impor-

tant principle of policy in connection with agricultural prices, namely that while the producer is entitled to a reasonable price for his products and to the benefits accruing from all reasonable and healthy rises in price, the prices of food products must on no account be allowed to soar to such extravagant heights as to drive up consumers' prices to an impossible and uneconomic level, a level which would adversely affect the interests of agriculture no less than those of our national economy in general.

The practical application of the principles embraced in this policy has always been, and continues to be, the constant aim of the Food Control Organization. In so far as production is concerned, it was therefore one of the principal tasks of the Organization to maintain and stimulate production by adjusting prices from time to time. In doing this the Organization has merely acted in the national interests. Failure to adopt this course of action would undoubtedly have resulted in very serious shortages of certain food products, since, as has already been stated, the hampering effect of inadequate labour, fertilizer and implements would in itself have been sufficient to curtail production. If, in addition, this had been coupled with unremunerative prices, a serious food shortage would have occurred months ago. By assuring a reasonable price to the producer and by taking every possible step to furnish farmers with as many instruments of production as could be obtained, the Organization maintained production on the highest level possible under present-day conditions. Moreover, wherever practicable, advance indications were given so as to enable farmers to know beforehand what prices they would obtain.

The following few examples will serve to indicate how price-stimulation was applied by the Food Control Organization and the control boards assisting it.

In the case of maize, the price was fixed at 15s. per bag for the 1942 crop, as against a price of about 10s. per bag (including the supplementary payment of 1s. 6d. per bag made by the Mealie Industry Control Board) during the previous season. The 1942 crop was very poor and the 50 per cent. price increase was necessary to compensate maize-producers for the small crop. In order to stimulate production and reassure growers that they would be fairly treated, even in the event of a record or exceptionally large crop, it was announced in September 1942 that maize-farmers would receive at least 12s 6d. per bag for the 1943 crop. This step had the desired effect and a very large area was planted to maize, and this, together with the fact that good rains were experienced during the first half of the summer, justified the hope as late as January that the crop would be in the neighbourhood of 26 to 30 million bags. At a price of 12s. 6d. per bag such a crop would have assured a reasonable income to the maize farmer. Owing, however, to the drought experienced in February, the crop was, unfortunately, considerably reduced. Maize producers were not left in the lurch, however, and the previously announced price of 12s. 6d. per bag was raised to 16s. per bag in bags for the best grades. This means that the maize-farmer will receive a better return this year than last year.

In so far as *wheat* is concerned, the prices fixed for the past few years were also of such a nature as to serve as an incentive to increased production and at the same time assure farmers of a reasonable income. In order to encourage the production of this vitally important food product and to give producers an indication

of the prices which they could expect for the 1942/43 crop, it was announced as early as March 1942 that wheat prices for that season would be fixed at 30s. and 30s. 6d. per bag, for Class B, grade 1 and Class A, grade 1, respectively, in comparison with 27s. 3d. and 27s. 9d. per bag for the same classes and grades during 1941/42. The result was an appreciable expansion in wheat production and one of the largest crops ever reaped in the Union. This year it was again deemed advisable to give an advance indication of the prices which would be paid for the 1943/44 crop, and during April last prices of 36s. and 36s. 6d. per bag for Class A, grade 1, and Class B, grade 1 were announced. There is no doubt whatever that this price will be an adequate remuneration to wheat-producers.

In so far as *dairy products* are concerned, it may be stated that the prices of butterfat, fresh milk and condensing milk were all maintained on a remunerative level for producers last year. This year an early indication was also given of the prices for these products. From 1 May the winter premiums came into operation and the gross prices for butterfat were fixed by the Dairy Industry Control Board at 1s. 9d., 1s. 7d. and 1s. 5d. per lb., respectively, with a 2d. increase for every grade from 1 July up to the end of October. Since 1 May, the price of cheese milk has been 11d. per gallon and that of condensing milk 1s. per gallon.

Farmers who sell slaughter-stock also can have no complaints. In view of their inflationary tendencies and in the interests of the stability of the agricultural industry, meat prices were fixed at a fair level by the Price Controller, but for various reasons this fixation was not effective, and slaughter-stock farmers obtained prices which were the highest ever recorded in this country.

In addition, there is still the constructive work of the Purchasing Section which, in a less conspicuous but nevertheless effective manner, contributed towards the maintenance of producers' prices, particularly in the case of perishable products such as vegetables and potatoes. By purchasing certain foodstuffs on a considerable scale for military camps and by exercising control over the supply to ships and convoys, this section undoubtedly counteracted in no small measure the dislocating effect of these factors on the market. Moreover, it also served as an important price-stabilizing medium for seasonal products, and counteracted temporary glutting of markets as far as was possible. Besides the important function which it fulfills for the benefit of consumers, this section also makes a really important contribution to the practical application of the general policy of assuring more stable prices to farmers.

Experience has, therefore, repeatedly proved the tremendous value of the Food Control Organization to the farmer. This Organization has become the pivot of his endeavours to secure a reasonable price, and his source of assistance for obtaining agricultural requisites. Our farmers must, however, no no account attempt to exploit the opportunities for gain offered by the present period of emergency. There were many people in the country who formerly did not appreciate the farmer's value. Their eyes have been opened, however, and they realize that our farmers experienced difficult times in the past and are entitled to make a reasonable livelihood.

On the other hand, just as there are certain commercial interests which selfishly oppose measures for the controlled marketing of farm products, since these restrict their speculative business to a basis of remuneration for services actually rendered, there are

unfortunately also farmers who would like to see prices uncontrolled —at least as long as they evince a rising trend. Such an attitude is more than unpatriotic; it is stupid and short-sighted, since it must inevitably promote inflation. Relatively speaking, even a slight regree of inflation is more dangerous to the agricultural industry than to any other, since long-term investments constitute such an integral part of the agricultural industry. Excessive prices are inevitably followed by heavier farm mortgages. We all wish to encourage the farmer to produce the nation's food, and to see him receive an equitable and liberal reward for his services, but, except perhaps in the case of the speculator-farmer who could sell in time, abnormal speculative profits have never been a permanent blessing to agriculture.

The country's annual expenditure on food amounts to many millions of pounds, and if products and food prices had not been controlled, prices and wages would have been very much higher than is the case at present, and inflation would have constituted a very much graver danger to the stability of our national economy. In point of fact, the anti-inflationary effect of the measures instituted by the Food Control Organization is one of the Organization's greatest achievements, more particularly because the approach to the entire food problem was based on a profound realization of the necessity for harmonizing the interests of producers and consumers by maintaining a proper equilibrium between the prices obtained by producers and those paid by consumers.

The Activities in the Interest of Consumers.

Equally important are the activities of the Food Control Organization in the interest of consumers. This matter is the subject of a great deal of misunderstanding, due to various factors. It is an irrefutable fact, however, that the Food Control Organization and the control boards assisting it have fulfilled their primary and most vitally important obligation towards the consumers of South Africa in that, in the case of the great majority of products, adequate supplies were made available and that prices were kept within reasonable limits.

It is necessary now to furnish a few facts in connection with the steps taken to regulate and rationalize distribution from the points of production to the consumers' centres, and to view the consumers' position in respect of some of the principal food products.

It will readily be understood that owing to transport difficulties, the unexpected arrival of convoys, etc., during war-time, distribution does not always proceed smoothly; but, if we taken into consideration all the obstacles which had to be surmounted, the inevitable conclusion is that during the past year the Food Control Organization accomplished a great deal in this field too. Take, for example, the valuable work of the Purchasing Section in this connection. Since this section possessed the supplies, it could not only meet the needs of convoys and ships in respect of products like meat, eggs, potatoes and onions, but also repeatedly rendered valuable services to coastal towns like Cape Town and Durban by releasing, at very short notice, such products as meat, eggs, and potatoes for civilian consumption. With regard to eggs, it may be mentioned in passing that while the scheme for the purchase and storage of eggs by this section will perhaps not succeed in meeting the total requirements of the country during the periods of scarcity, it will at least ensure the equitable distribution of such supplies as are available.

In so far as the position with regard to other products is concerned, it may be stated that the measures applied in respect of *wheat* proceeded smoothly and satisfactorily. The measures instituted in April 1941 for the conservation of wheat in order to keep the supply position on a sound basis were successfully continued.

Steps were also taken, in co-operation with the Wheat Control Board, to import sufficient wheat at a minimum cost to supplement the shortage occasioned by several short crops and to safeguard the nation's bread requirements. By the introduction of standard meal and the standard loaf, an annual saving of 16 per cent., or about 750,000 bags, was effected in our wheat consumption—a noteworthy contribution to the national anti-waste campaign. There are, of course, persons who complain that they cannot obtain fine white bread, but the policy pursued is that the interests of the whole country are a weightier consideration than the fastidiousness of a few individuals. In any case, fine white bread is still supplied to persons actually suffering from certain ailments. And as for prices, the consumer can to-day obtain for sixpence a standardized 2-lb loaf, containing 100 per cent. wheat meal, as compared with a lighter loaf during the first Great War which frequently cost more than ten pence and contained about 20 per cent. mealiemeal.

Mention has already been made of the other important cereal crop, namely, *maize*. This presented much greater difficulties. The small crop unfortunately necessitated fairly strict rationing, and privations were undoubtedly suffered in certain native territories and also among stock.

If, however, the maize problem as a whole is reviewed, it must be admitted by all that the Food Controller, sometimes by admittedly unpopular regulations, nevertheless succeeded under exceedingly difficult circumstances in averting actual famine and in supplying maize where it was most needed. In any case, had it not been for the timely conservation of maize and the rationing measures instituted by the Food Control Organization and the Maize Board, the marketable portion of the crop would have been exhausted by December 1942, and a very serious famine would have occurred in the native territories. Although, owing to the lateness of the new crop, considerable difficulty was experienced in meeting all the requirements for human consumption until the new crop became available, this extremely intricate matter was ultimately settled, perhaps not to everybody's satisfaction, but without any appreciable damage to our national economy.

The distribution of *tea*, on the other hand, was particularly successful. Tea cannot actually be described as a food commodity, but most of us consume it practically every day, and it is, therefore, an important article. By voluntary co-operation with the trade, the distribution of tea has already been organized for over a year on the basis of 75 per cent. of the quantities used in 1941. Starting with the packers, this organization extends to the wholesale and retail dealers and finally to the consumers. We are here really dealing with a controlled article which is imported, and in respect of which a slight degree of rationing is accepted without complaint, in spite of the fact that the available quantity has been reduced by one-quarter. It also furnishes an excellent example of how wastage can be eliminated by proper control and distribution, for since the Union now saves fully £600,000 per annum on tea, quite apart from the saving of one-quarter on the total quantity of tea previously imported.

Largely as a result of the maize shortage of the past year and also because of the influence of certain seasonal factors, the supplies of *dairy products* have lately shown a considerable decline.

Fresh milk is, however, still available in adequate quantities. In the case of *butter*, as in that of tea, the rationing imposed through the trade whereby dealers are authorized to supply consumers with 85 per cent. of the average purchases during January and February, is proceeding smoothly. The Dairy Board ensures that the instructions are carried out with the least possible inconvenience to consumers. Supplies of *cheese* are unfortunately smaller than those of butter, but the general public can still obtain reasonable quantities. Incidentally, it may be stated that not only supplies, but also prices, are regulated in a manner calculated to benefit consumers. During the previous World War, for example, consumers sometimes paid as much as 4s. 6d. for a pound of butter, while to-day they are still able to obtain first-grade butter of infinitely superior and more uniform quality for 1s. 10d. per lb.

The seasonal nature of *vegetable products* gave rise to several problems which could not easily be solved. It must be borne in mind that we are dealing here with a highly perishable seasonal product, and that except in the case of potatoes and onions very little can be done to regulate production. The remedy lies principally in increased production and, had it not been for the severe frost experienced during winter in the lowveld areas, the public would have had little reason for complaint in regard to supplies and the prices of vegetables.

In the case of *meat*, conditions were less satisfactory, mainly because of the impossibility of controlling the supply of livestock still on the farm. The rapid increase in the number of slaughterings since 1939, the increased demand for trek-oxen on the part of farmers, and the heavy purchases of livestock as an investment (mainly by well-to-do townsmen and more often than not to avoid income tax), are all factors which exercise an adverse effect on the regular supply of the country's food requirements. The whole meat position, however, is at present being investigated by a commission, and it is hoped that this commission will make recommendations which will lead to an improvement in the position.

To sum up the position briefly: although there are people who complain, there is, according to pre-war standards, sufficient food in the country for the maintenance of the nation. Sporadic inconveniences were experienced and we sometimes had to do without delicacies, but up to the present there has never been a shortage of wholesome food as such. An important point worth mentioning in this connection is that the Food Control Organization gives constant advice to housewives, through the medium of bulletins and the radio, in connection with the preparation of nutritious and attractive meals from the available foodstuffs. Our food control policy is designed to avoid sensationalism, but is based on a sensible approach to the whole question, an approach which, above all, takes our own specific conditions into account. It is neither ambitious nor revolutionary, but envisages only what is practically attainable and feasible. Of course, mistakes were made here and there, but these are inevitable in any human effort. Food control in conjunction with price control conferred palpable and important benefits on the nation, for which we should all be grateful.

Indeed, the nation as a whole has every reason to be deeply grateful for the important position occupied by farming in our

national economy. Had it not been for this fact, we would not have been spared much of the anxiety suffered by other belligerent countries in so far as the proper feeding of their civilian and military population is concerned.

Complaints against Food Control.

Nevertheless, complaints there were. On the whole, the co-operation on the part of both the producers and the consumers was good, but as is naturally to be expected, certain sections of the public did not display that co-operation which the Food Controller should have been able to rely on in this period of crisis. It is, therefore, necessary to deal with some of the complaints here and to view the actual facts in their true perspective.

The first to be mentioned are the *strong representations made by certain farmers from time to time for still higher prices* than those which they already obtain. It must be stated unhesitatingly that the majority of our farmers are alive to their responsibility in this connection, and have generally endeavoured to preserve the right price equilibrium. Unfortunately, however, there were others who failed to do this. Quite blind to the fearful consequences of their demands for excessive prices—of which an aggravation of the over-capitalization problem and the exhaustion of their soil are but a few examples—they pay no heed to the future and endeavour to avail themselves of the present opportunity not only for recovering all their past losses within a few years, but also for amassing a fortune. This attitude is, of course, strongly to be deprecated. Persons animated by this desire are undermining the very foundations of the agricultural industry and are gambling with the future of agriculture. The stability af our future national economy manifestly demands that prices, including those of primary products, should not soar to excessive heights. Consequently the State—and not the Food Controller, because in reality the State fixes prices, the Food Controller merely being the instrument which gives effect to the price-fixation policy—is pursuing a sensible policy, which, while allowing reasonable price advances, also counteracts inflation. It is in their own interest that all farmers should give this policy their full support. The State fosters their interests and it is, therefore, their duty to look after the destiny of agriculture.

By far the most *criticism of the work of the Food Control Organization, however, came from the urban section of the community*. Totally unmindful of the hardships suffered by the inhabitants of so many other belligerent countries, many consumers immediately start agitating whenever , as a result of a local and temporary dislocation of supplies or of seasonal shortages, they are unable to obtain the same large quantities and variety of foodstuffs as in the care-free days of peace.

Another aspect of this matter is that the consuming public in general has not yet accepted control as an essential part of our economic system. They are still all to prone to exaggerate out of all proportion any small inconvenience, which they sometimes experience as a result of control measures, and to disregard all the benefits accruing from control. Many have never even reflected upon the fact that the benefits of control far outweigh any temporary discomforts, especially in these abnormal times.

That this is the case has been abundantly proved by the course of events during the present war. The Food Control Organization and the Department are indeed in an exceptionally fortunate position in having at their disposal *the services of the existing machinery of*

product control boards instituted under the Marketing Act of 1937. These boards are doing excellent work in the national interest, and although they are not always without fault, have successfully carried out their task of food conservation and distribution. Examples are to be found in the case of a product like sugar which is controlled by a suitable organization, and in the case of tea, in respect of which an appropriate control organization was specially set up by the Food Controller. In spite of the criticism levelled against control boards and the allegation from certain quarters that the work could have been carried out more successfully by private enterprise, an unbiassed analysis of the position reveals that actually the consumers received least protection and had most cause for complaint in the case of food products like eggs, meat and vegetables, for which no machinery exists for centralized physical control. There are indications—unfortunately not yet nearly enough—that consumers are beginning to realize that organized distribution promotes stability of supplies and prices. Moreover, the boards are also of great assistance in eliminating waste, particularly the type of waste which formerly took place on a national scale as a result of uncoördinated distribution and the duplication of services and costs. Farmers should, therefore, be proud of the fact that these boards have proved such an asset and could adjust themselves so rapidly to the changed circumstances, and make a valuable contribution towards the prosecution in these difficult times of the activities envisaged by the State for advancing the economic and social welfare of the country.

One of the principal complaints is that, according to the latest scientific views on nutrition, *the available foodstuffs, especially those of a protective nature, are insufficient* for the proper feeding of our whole population of 10 million. Assertions are made that malnutrition is rife among the native population, and that steps should, therefore, be taken to make protective foods such as milk, butter, cheese, meat, fruit and vegetables available to the whole nation. Although the principle of better nutrition is generally accepted, and efforts are being made to achieve its realization, it is too much to expect such drastic changes to be effected under the prevailing emergency conditions. It is also doubtful whether the dietary habits of natives can be changed in this manner and in such a short time. In any case, the existing organization was not instituted with the primary object of performing this kind of work; the Department of Native Affairs and the Department of Public Health appear to be the obvious departments to be charged with the work of attending to the interest of the lower-income groups.

A further important point in this connection is that most complaints came from the side of consumers in regard to distribution at the ports touched at by convoys and ships, namely, Cape Town and Durban. Particularly was this the case in respect of meat and eggs. This is by no means surprising since these are the very products in respect of which physical control is still inadequate. Indeed, in physical control of supplies lies the secret of the success of any steps calculated to ensure equitable distribution, and this matter calls for further attention in so far as certain products, especially meat, are concerned. The Organisation recently assumed full control over cold-storage eggs, and the expectation is cherished that the distribution of eggs will be better regulated than during the previous season.

We now come to the question of *rationing*. Many consumers feel that distribution can be placed on a better footing by the institution of a system of individual rationing. Various reasons may be

advanced in favour of this argument, but the arguments against are much weightier. In the first place, the Union cannot be compared with food-importing countries, since rationing becomes necessary only when the total food supply of a nation is smaller than the total demand, and this is not the case in the Union. Secondly, rationing under a coupon or card system according to individual needs would be infinitely more difficult in this country with its European and native populations than in most European countries where the differences in the needs of the various sections of the community, their habits and their diet, quite apart from their purchasing power and standard of living are much smaller than in South Africa. A third factor which makes individual rationing very difficult, is the scattered nature of the population, and, in any case, the application of a scheme of this nature in rural areas would be fraught with the greatest difficulty. Fourthly, there is the tremendous Administrative machinery which such a scheme would necessitate. The mere fact that a personal register of every man, woman and child would be required, necessitating the appointment of thousands of supervising officials, will immediately furnish some little idea of the enormous scope of such a scheme.

The question of individual rationing has frequently been discussed, and the general opinion is that in respect of no product are supplies so short that the time has come for individual rationing. Rationing through the trade, as carried out in the case of butter and tea, is a comparatively easy and inexpensive task, and will be continued as long as it is warranted by circumstances. Individual rationing on the other hand will be introduced only when it becomes absolutely imperative—when practical needs outweigh practical obstacles and when social justice and the national interest make the institution of such a gigantic organization essential.

In connection with complaints against food control, attention should be drawn to the problem of subsidization. In so far as this matter is concerned, it is admitted that the prices of certain food products are somewhat high for the lower-income groups. This is a problem, however, which can be remedied only by subsidization but not at the expense of prices to the producer.

Post-war Problems.*

National reconstruction—the rehabilitation and readjustment which will be necessary after the war in order to place agriculture on a normal footing of development again—has become a question of paramount importance. Consequently, a few remarks on this subject will not be out of place here.

For the past three centuries agriculture has formed the broad foundation of the economic life of South Africa; and in the future South Africa will remain pre-eminently an agricultural country, notwithstanding the enormous and welcome development being witnessed at present in the field of industry, a development which will assure a bigger local market for a greater diversity of agricultural products to the agricultural industry. Indeed, it must be regarded as axiomatic that farming is indispensable to the national welfare, that, in point of fact, it constitutes the foundation of any permanent and stable national economy, at present no less than in the future. It follows that commerce, industry, the professions and urban life in general have no independent existence of their own, but

* At the moment a departmental committee is engaged on the investigation of the whole problem of post-war agricultural reconstruction, and it hoped that the report of the committee will be available at an early date.

are all economic activities resting on agriculture as a foundation, and the general national stability is, therefore, inseparably bound up with the stability of agriculture. Consequently, all our plans for post-war reconstruction must proceed from the assumption that farmers will always constitute a *permanent* and essential part of the community, and we must at all costs avoid the mistake made in so many European countries where industrialization was accompanied by the neglect of agriculture.

Our programme of national reconstruction, in so far as it applies to agriculture, will have to cover a very wide field. It will, *inter alia*, embrace problems such as erosion control, veld improvement and maintenance, weed eradication, improvement of farming systems, the building up of animal and crop production industries, systematic food conservation, organization of marketing, stabilization of prices, over-capitalization, uneconomic sub-division of land, etc. All these problems have an economic background, however, and certain aspects of this background will now be reviewed in this report.

The farmer's outlook.—This is a matter of the utmost importance to the future of farming in South Africa. The economic problems of agriculture are due mainly to modern conditions—they are the outcome of the period of commercialism and industrialism which we have been witnessing during recent years. Amongst other things, these conditions have made it necessary for the producer to mobilize all his production forces and resources on the farm for the mass production of specialized products for the market.

In many respects this is a regrettable fact. There are, unfortunately, people who fail to realize that there is an immense difference between urban and rural areas, socially as well as economically, and that any attempt at forcing the outlook and methods of the townsman on the farmer must inevitably have an adverse effect on the farming community. The farmer must retain the correct mentality—a "rural" mentality—the essence of which is a love of his soil and his stock, a love of rural matters and outdoor life; indeed, a love of anything stable and permanent, and of the whole biological process daily unfolding itself on his farm. Hand in hand with this must go the endurance and patience which animated the pioneers who made this country a safe place for us to live in. Without these qualities and this love we cannot make a success of our post-war task.

Acceleration of Agricultural Production.—National reconstruction demands in the second place, that there should be no relaxation, but rather an acceleration of our agricultural development, and that greater progressiveness should be encouraged in our farmers. If we do not wish to cripple the economic effort of the country and deny agriculture the key position which it occupies in our national economy, there can be no question of relaxation or hesitation. On the agricultural industry devolves the great and responsible task of providing food for the nation and raw matrials for the industries. In order to fulfil this function properly, farming must keep pace with and adapt itself to modern developments and services, otherwise farming, as well as other industries—in fact the entire economic life of the country—will deteriorate.

Existing conditions emphatically demand an accelerated pace and greater progressiveness in the pursuit of agriculture. Indeed, we must expect even more exacting demands on agriculture in the future, and our farmers must prepare themselves to meet these

demands. In the interests of national economy the best and most intensive use should be made of our agricultural resources, for from a fundamental point of view the future well-being of the nation mainly depends on the increased productivity and output of the agricultural industry.

Against this there is the fact that our present-day agricultural production per unit is relatively low. There are, however, great possibilities. In order to give these possibilites the maximum scope for development and to turn them to the best account, agriculture must be accorded a prominent place in the national programme of post-war reconstruction. Or, to put the matter differently: the great expansion in the field of industry is very desirable and essential, but it should be supplementary to agriculture and not enjoy national preference. Above all, industrial development must not take place at the expense of agriculture. Our plans for a balanced national economy must, therefore, be carried out with special regard to the necessity for increasing the productivity of agriculture in all its phases, primary as well as secondary.

Price Parity.—One fundamental requirement for this is a reasonable and stable price to the producer which will assure a respectable livelihood to him and his family. This point must be emphatically stressed for the time has come to abandon the old-fashioned idea that there should be such a great difference between agricultural and industrial prices. It is our serious opinion that the fixed policy for the future should rest on the principle that the farmer is entitled to prices as closely as possible on a par with those of the industrialist. The adoption of this principle would mean a significant forward step towards the solution of numerous world problems.

There is no legitimate reason why this cannot be achieved. It may perhaps be asserted that production costs have advanced relatively more rapidly in the industrial world during recent years than in the agricultural industry, and that some justification should, therefore, exist for this difference. Persons who reason along these lines, however, lose sight of the fact that in recent years those parts of the world which are suitable for agricultural production have become smaller and smaller, that arable land is now much more expensive and that there has been a substantial increase in farm wages in consequence of the new social legislation which is a feature of our times. Consequently, the accelerated agricultural development in many countries was possible only through an intensification of the agricultural process, and this, in turn, was accompanied by a rise in production costs in agriculture. On the whole, therefore, a considerable rise in production costs has taken place in the agricultural industry.

Another point which should be borne in mind in this connection is that agriculture can never be completely safeguarded against the vagaries of nature, and that, in comparison with the more or less stable and mechanically-regulated production of the industries and the consequent stability of income, agricultural production is continually exposed to serious risks arising from uncontrollable natural conditions. These risks find expression in greatly varying yields which sometimes are not even sufficient to cover the production costs of the primary producer. There is also the further consideration that in the case of dislocation or interruption in the production process, industries can adapt themselves to the changed conditions very much more rapidly than agriculture. This is another factor which places agriculture in a less favourable position in so far as relative profitability is concerned. Consequently, it is essential to appreciate fully

the fact that agriculture is fundamental in our economic life and that in normal times agricultural production warrants a remuneration commensurate with the unique position which it occupies.

Price Stabilization.—The following step towards ensuring a reasonable price to the producer is the vigorous pursuit of the policy of aiming at a more stable price for agricultural products. Experience all the world over has already shown that there is only one method of achieving this, namely, the application of a judicious system of control in respect of the marketing of agricultural products, which, where necessary, embraces the principle of price fixation. It has already been pointed out that the criticism directed against control boards is based mainly on a misunderstanding. Control merely consists in a conscientious endeavour to regulate prices and supplies in such a manner that both the producer and the consumer derive the maximum benefit. Who can dispute the soundness of this policy?

The marketing side of agriculture does not yet rest on a sound foundation and there are many defects which must be eliminated. Furthermore, the post-war marketing problems will be even more complicated than the pre-war or wartime marketing problems. It does not require much insight to realize that a war-ravaged word, burdened with heavy debts, will not have the purchasing power to absorb our agricultural surplus on any extensive scale—if we do ever happen to have a surplus again—and still less to pay high prices for it. Our farmers will have to find their largest market within the borders of the Union. In addition, steps for the more effective development of local markets are not only indispensable from the point of view of the marketing of agricultural production, but also from the point of view of the better feeding of the nation as a whole. One fact is certain, however: all future measures for improving the local market will have to take due account of the system of organized marketing embraced in the provisions of the Marketing Act. The war has retarded the normal development of the control system, but as has already been indicated, the value of these boards has been conclusively proved during the past four years. Control in respect of the marketing of agricultural products has proved a successful experiment, and we must utilize this system to an ever-increasing extent in order to ensure better and more stable agricultural prices.

Prices and Post-war Arrangements.—It stands to reason that the post-war international situation will exercise a very pertinent influence on any attempts to improve and stabilize the prices of agricultural products. We are, after all, very closely linked up with other parts of the world, and we cannot escape international influences. Actually, the success of our efforts in respect of price stabilization is inseparably bound up with stabilization in international spheres, or to put the matter differently: we must pay the closest attention to international planning and ensure that our own plans are carried through in harmony with international planning. Fortunately, there are clear indications that responsible statesmen are already fully alive to the position which agriculture should occupy in the post-war world. This fact holds out the hope that the agricultural industry will receive its due share of attention in future international arrangements.

Social Security and the Farmer: So much is heard these days about social security. The remarks so far made about the economic aspects of post-war reconstruction are all directly or indirectly related to this matter. Social security aims at the adoption of a policy calculated to assure a reasonable livelihood to all persons

desirous of making an honest contribution to the labour and services required for the essential activities of the national community to which they belong, a policy which will protect them as individuals against disasters which they are unable to cope with themselves, as for example, illness or accidents, economic depressions, unemployment, or violent fluctuations in the prices of commodities purchased or sold. The underlying motive is therefore very laudable, and it is already obvious that the post-war period will be characterized by a significant forward movement towards greater economic and social security for the average citizen. The farming community is very closely affected by this movement, not only because the vast majority of farmers belong to the group known as average citizens, but also because, as producers, they will be required to make a large contribution towards the means for securing social security.

As a community, farmers are not affluent. Most of them belong to the average class, the class of hard-working people who must be content with a relatively small portion of the national income, the class which is involved in a relentless struggle with economic and natural difficulties and a very small percentage of whom ever enter the ranks of the well-to-do. The majority of our farmers have fortunately not chosen money-making as a profession; they are not yet possessed by the selfish spirit of grasping for personal gain and amassing wealth without consideration for their fellow-men. All that they desire is a reasonable livelihood and economic and social security for themselves and their families.

Finally, reference has already been made to the necessity for maintaining a large number of farmers in our population. This is extremely important from the point of view of social security. The greatest emphasis must be laid on the fact that a well-balanced and organic national life is not possible unless an appreciable farming population constitutes an essential part of it, numerically and in all other respects. Our task for the future is therefore clear: conditions must be such that there will always be room for a large number of people in rural areas. Once this primary requirement is reasonably favourable, we need never fear a depopulation of the rural areas, for the love of farming and farm life which is innate in so many South Africans will be sufficient security against any such event. Thus, by exercising a stabilizing influence on the population, the farming community can and will make a considerable contribution towards the attainment of social security.

Also in respect of its other important function agriculture will not neglect its duty, but will provide a considerable portion of the food and other commodities which can assure a secure livelihood to the population of the Union. Naturally, here too a reasonable price to the producer is of the utmost importance.

Any scheme for social security must therefore take full account of the position of the farmer. Indeed, the security of the farming community is indispensable to the maintenance of the European population in South Africa. Social security for any group is impossible without the fullest co-operation of farmers. The farming community of our nation includes a large percentage of those who are prepared to contribute their full share towards the total national service, but numerous factors hamper their sustained efforts. The elimination or reduction of those impediments will pave the way towards a healthier, stronger and more prosperous South African nation.

II. The Practical Activities of the Food Control Organization.

THE activities of the Food Control Organization are already wide in their scope, and it is now necessary to follow up the general discussion in the introductory chapter with a more detailed elucidation in order to view the work as a whole in its correct perspective. Commencing with production, we shall investigate the steps taken locally to maintain supplies and then proceed to deal with the work carried out in connection with canning and importation with a view to supplementing supplies. After that we shall discuss the work conducted for the enlightenment of farmers and finally give a brief review of the most important food products in order to indicate how the measures for distribution, marketing and purchasing worked in practice.

Stimulation of Production.

The Livestock Industries.

In most cases the production of animal-husbandry products is a long-term undertaking and, consequently, apart from better feeding and care, little could be done to effect an immediate increase in production. In the case of pigs and poultry, however, it is possible, if sufficient concentrates are available, to bring about a more rapid turnover, and everything possible is being done in this connection by means of total production as well as imports, to influence the feed position in such a manner as to increase the output of the products concerned.

Price is also employed as an instrument for stimulating production, although recourse to this is necessary only in the case of a few animal-husbandry products. The price of bacon has, for example, been fixed at a level which makes it possible at present for the manufacturer to pay from 8½d. to 9d. per lb. for delivered first grade baconers.

Other products derived from farm animals, as, for example, milk and eggs are equally dependent on the feed and price position and, consequently, also received special attention.

Stock Feeds.

Good progress was made during the year by the Feed Committee. The compulsory registration of all stock feeds and their standardization appreciably reduced the possibility of exploitation of the consumer. It is gratifying to record that not a single dealer in feeds opposed this step, but that such registration was actually welcomed. The list of feeds was extended to include the maximum number possible with a view to standardization.

As stated in last year's report, the demand for protein-rich feeds exceeds the supply. The Union is dependent on imports for at least three-quarters of its protein feeds, with the result that it is well-nigh impossible for farmers and feed-mixers to obtain sufficient protein feeds owing to the shortage of shipping space. Consequently, further steps were taken with regard to the establishment of an association of feed manufacturers under the auspices of the Oil Expressers' Association to undertake and facilitate the importation and distribution of protein-rich feeds.

The demand for *brewers' yeast* steadily increased, both as a source of vitamins in feed products, particularly pig and chicken mixtures, and as a raw material for the manufacture of " Marmite " and " Vitamite " for human consumption. In the latter case manufacturers succeeded in making available a by-product which is roughly equivalent to one-third the amount of the original brewers' yeast used and, nevertheless, equally suitable as an animal feed.

Stock Licks sold in the past showed marked variations both as regards their composition and the prices at which they were sold. This matter was tackled with a view to standardization. Consequently, arrangements were made for the disappearance from the market of all stock licks except four standard licks which were determined and can be approved by the Department. These four standards are based on the actual requirements of animals, and therefore aim at the most effective provision of phosphates, chiefly to small stock. These measures rendered possible the control of both the quality and the selling price of stock licks—an important step in the right direction.

The fixing of the *maize feed rations* from 1st July 1943 was undertaken by the Feed Committee for the following three months, and will in due course be amended if the maize supply position justifies such a step.

The Bonemeal Position.

Prior to 1942 the annual consumption of bonemeal amounted to approximately 30,000 tons, of which about half had to be imported. Owing, however, to a shortage of shipping space and the high transport costs, the importation of large quantities of bonemeal is no longer possible, consequently, every effort is being made to encourage the increased production of bonemeal in this country. If only full use were made of the bones of the animals slaughtered every year at abattoirs, the Union would be able to meet most of her bonemeal requirements. In order to alleviate the position a prohibition was in the first place imposed on the use of bonemeal as a fertilizer. The estimated consumption of bonemeal for this purpose amounted to approximately 2,000 tons per annum. Secondly, serious efforts are being directed at collecting bones. Municipalities, schools, military camps and other organizations are beginning to display an interest in this national service. The positon is still far from satisfactory, however, and mortality among stock and loss of condition, still of frequent occurrence owing to inadequate bonemeal supplies.

The rationing of bonemeal, and its sale under permit only was necessitated by the shortage and the consequent necessity for uniform distribution of the available supplies, particularly among farmers who are able to furnish adequate proof that the feeding of bonemeal is absolutely essential in order to prevent serious losses as a result of lamsiekte, stywesiekte, etc., among their stock. In this way the flow of bonemeal supplies to areas where it is most needed is ensured. A permit authorizing the purchase of bonemeal or stock licks is valid for one quarter only. After the date of expiry, farmers are required to resubmit applications in writing clearly setting forth their case. Full particulars are required in regard to the size of the farm, the district in which it is situated, the number of cattle and sheep to which bonemeal will be fed, reasons for feeding bonemeal, and the minimum requirements for the three months or portion thereof.

Although it is realized that the shortness of the period for which a permit is valid, is responsible for a certain amount of in-

convenience, a change in the system is unfortunately impossible, owing to the shortage of supplies. Every fourteen days returns are received from all bonemeal and stock-lick manufacturers stating the quantity of bonemeal or lick manufactured, the quantity sold, and the expected production. The issues must then be properly co-ordinated with this information.

During the first six months of the year approximately 8,700 tons of bonemeal were manufactured. This quantity was issued against 17,262 permits for the feeding of bonemeal to 1,344,514 head of cattle and lick to 2,068,459 sheep. The estimated bonemeal production for the year is considerably lower than was originally expected, and is put at roughly 17,400 tons. The position cannot therefore be regarded as favourable, and it is clear that vigorous steps will have to be taken to effect an improvement in the present methods of bone collection.

Crop Production.

In so far as crop production is concerned, the position during the past year was considerably better than during the previous year, in spite of the hampering effect of the shortage of farm labour, fertilizers and implements.

Notwithstanding these limiting factors everything possible is being done through the medium of the field, publication and publicity services in an endeavour to increase production by improved farming practices and better methods of cultivation.

It would appear as if the attractiveness of high rentals is blinding some landowners to the irreparable destruction and exhaustion of the soil caused by the incorrect methods practised by certain lessees. It must be pointed out here that in some cases lessees break up new land on an extensive scale and in this way utilize the fertility of the new soil for the production of crops which would otherwise have been grown on the old existing lands if adequate fertilizer had been available. Apart from the activities in connection with the supply of fertilizer and the making of compost, attention is also being given to the application of rotational cropping with legumes, not only for the preservation and maintenance of soil fertility, but also for supplementing the serious shortage of proteins in the form of food and feeds.

It is of importance to mention at this juncture that special attention is also being given to the testing out of crops and fibres which have hitherto not been produced in the Union. Particularly promising experiments have, for example, been carried out with rice on marshy land and dryland in Zululand. Smaller experiments have also been conducted under irrigation on the Pongola Settlement with good results. Good progress has also been made with the production of fibre. *Phormium tenax* and Sunn hemp appear to be the most promising, and the latter, in particular, may hold out considerable possibilities for the future.

Seed Production and Importation.

Apart from the normal activities and research work of the various Divisions of the Department in regard to production, the emergency conditions also necessitated special steps for the local production of certain seeds which had formerly for the greater part been imported. These include, *inter alia*, vegetable seeds, certain grass seeds and the seeds of certain brassicaceous fodder crops.

Seed Potatoes.

Owing to the fact that under most South African conditions seed potatoes lose much of their productivity after a few years as the result of degeneration diseases prevalent in this country, the State found it necessary to import a limited quantity of seed potatoes, viz., 1,250 tons (or 27,000 boxes of 100 lb. each) from Scotland and Ireland. Since commercial firms which in peace-time undertook the regular importation of seed potatoes, were not prepared under the present circumstances to bear the financial risks attached to possible rotting at sea, the Food Controller undertook such importation. In order to ensure that the seed potatoes were utilized to the best advantage, an agreement was entered into with the Department of Lands to plant a total of about 6,000 boxes on the Vaal-Hartz and Riet River Settlements and to place the resultant crop at the disposal of farmers as " first from imported ". In this way more than 20,000 bags of such seed potatoes were sold to farmers at prices ranging from 22s. 6d. to 30s. per bag, depending upon their size.

Some consignments arrived late, and consequently a further 4,000 boxes were transferred to the Department of Lands for winter planting on the Pongola Settlement with a view to offering the resultant crop to farmers as " first from imported ". Supplies from still later landings, viz., 4,573 boxes were kept in cold storage until August, after which they were issued to farmers.

The scheme for the importation of seed potatoes is also being continued for the 1943/44 season, and it has been decided to import 1,000 tons (22,400 boxes of 100 lb. each) of a number of varieties and to distribute them in the same way as was done this year.

Seed-potato Inspection Service.

Once again the Potato Advisory Committee endeavoured to establish a further number of seed-potato growers' associations in suitable areas, in order to encourage seed-potato production in the Union as much as possible. As a result of these efforts, the number of associations increased from 21 to 28, with a production of roughly 60,000 bags of A and B " Government Certified " seed potatoes. The fact should be emphasized that, on the whole, producers of table potatoes are not yet sufficiently alive to the value of good seed potatoes. By means of extension work and demonstrations the Department endeavours to make farmers more appreciative of the value of sound seed potatoes which are a primary requirement for good production.

Through the additional inspection service instituted in 1941 for the benefit of individual farmers who do not belong to seed-potato growers' associations, a further 75,000 bags of " Government Inspected " seed potatoes were approved during the year. The two inspection services were therefore responsible for the supply of 135,000 bags of good seed potatoes, an amount which represents roughly 25 per cent. of the total annual plantings .

In view of the large number of growers' associations which have already been established in the most suitable seed potato production areas and the fact that under the second scheme production cannot be as effectively controlled by the Department as in the case of growers' associations under Scheme 1, it was decided that at the close of the 1942/43 growing season the inspection service in respect of individual farmers would be discontinued. In future, therefore, the production of " Government Certified " seed potatoes will be

allowed and encouraged only when undertaken by organized seed potato growers' associations.

Teff Seed.

As a result of the dry summer of 1942 and the inadequate supplies of teff seed produced, farmers were warned in good time to use their seed supplies sparingly and to produce their own seed requirements as far as possible for the following season. This, together with a better season last year, brought about a very great improvement in the teff seed position.

Lucerne Seed.

Owing to unfavourable circumstances the production of lucerne seed during the past year was considerably lower than usual. While a more extensive cultivation of lucerne, particularly as a rotational crop and as a farm feed, is strongly advocated, it is essential that farmers in the suitable areas should also take into account the necessity for producing suitable seed, otherwise a shortage of lucerne seed may arise.

Chicory Seed.

The inadequacy of imported seed upon which the industry was exclusively dependent in the past, coupled with the hampering of seed production by the chicory producers themselves in the Alexandria area during the 1941/42 season, mainly as a result of drought, necessitated the institution of measures by the State. Consequently, seed production was undertaken for the Chicory Control Board at certain state institutions such as colleges of agriculture and experiment stations in order to keep the industry going. The co-operation of the Department of Lands was also enlisted to undertake seed production on some of its settlements, *inter alia,* at Loskop, Pongola and Vaal-Hartz. The undertaking was reasonably successful, and about two-thirds (viz., 4,000 lb.) of the industry's seed requirements were produced in this way. In addition to this production, chicory farmers in the Alexandria area this year also succeeded in producing roughly 9,000 lb. of seed as a result of more favourable rains. The industry's seed position is therefore assured for the following two years, and at present special efforts are being directed at the production of better quality seed.

Vegetable Seed.

Subsequent to the institution in February 1942 of control over the importation and exportation of vegetable seed it was realized that the only way in which the shortages arising from inadequate importation of vegetable seed could be supplemented, was by greater concentration on local production. For this to be effective, however, it was necessary to institute measures to ensure that the seed produced satisfied certain requirements in respect of quality.

As far back as the beginning of 1942 a commencement was made on private initiative with the production of seed of a few kinds of vegetables, but these efforts soon appeared to be inadequate. Consequently, the establishment of a Seed Dealers' Association was undertaken in close co-operation with the Division of Horticulture, and in this way a co-ordinated effort was made to satisfy the country's seed requirements. As a result, vegetable seed production progressed with leaps and bounds. Whereas at the beginning of the war, all vegetable seed, except for isolated exceptions, was imported, the position has improved to such an extent that to-day the local produc-

tion is not only adequate in the case of practically all kinds of vegetables but in some cases there are even surpluses available for export. In fact, a new national industry has been built up.

In pursuance of Government Notice No. 1336 of 1943 seed growers can also register with the Division of Horticulture, and seed which is produced in accordance with the recommendations of the Department, may be sold as "Government Approved" seed. In addition, every effort is being made by furnishing advice and undertaking inspection to improve the quality of the seed produced and to effect standardization as far as possible.

Grass Seed.

In view of the extreme difficulty attending the importation of grass seed in the present circumstances, further efforts were made during the past year to encourage the production of seed of exotic pasture crops as much as possible. In this way the seed production of various varieties was promoted, although farmers do not yet display sufficient interest in this matter. The Department is, however, proceeding with the work in an endeavour to enable every farmer to produce his own requirements at least.

Import Arrangements.

The measures for control over the import and export of foodstuffs mentioned in last year's annual report have been continued, but owing to the serious shortage of shipping facilities from the United States of America and Great Britain, the Food Control Organization was compelled to tighten up the control on imports and to recommend that only absolutely essential requirements should be allowed to be imported. Except in the case of requirements such as wheat, tea, fertilizer, farming machinery, flour and tinned milk, the remaining available space had by way of a system of strict priority rating to be allotted to other important items such as machinery and spare parts required by vegetable, fruit and milk canning factories, cheese and butter factories, the baking industry and the meat industry, including municipal abattoirs, butchers, etc.

To a lesser extent shipping facilities could be obtained for requirements such as tinned meat, rice, spices, specially prepared foodstuffs for invalids and infants, malt and hops, vegetable and other seeds, cocoa beans, gelatine, etc. The issue of import permits in respect of commodities such as breakfast foods, tinned fish, edible nuts and less important foodstuffs had to be discontinued altogether. Fortunately, the position has impproved to such an extent during the latter half of 1943 that a large quantity of the goods on order from the U.S.A. and Great Britain for months, and even for years, could be shipped. As regards the shipping of essential commodities from the countries mentioned, it is expected that the most difficult period is past, but in spite of improvement, it still remains necessary to apply a system of priority rating in order to keep key industries going and to meet the essential requirements of the country.

Apart from shipping restrictions, it is becoming increasingly difficult to obtain vitally important supplies from countries such as Great Britain and the United States of America. Before the war and during the first few years of hostilities, supplies were obtainable without any difficulty from a country like America, but the position in that country has undergone a fundamental change with the result that the American Government gives permisison for the release and export of the most essential raw materials, food supplies and

machinery only after the country for which such goods are destined has indicated beforehand to what extent such commodities are essential for the continuation of the war and the maintenance of vitally important industries, and has also submitted an estimate of the nature and quantities of each kind of raw material or manufactured article required. As a result of these stipulations it has become necessary to take steps for the collection and elaboration of comprehensive statistical information, which in the present circumstances is an exceedingly difficult task. Nevertheless, the progress made so far is satisfactory and it is confidently expected that it will be possible to obtain for the Union such essential supplies and equipment as are available.

Dehydration and Canning of Products.

Vegetables.

During the previous World War the dehydration of vegetables was carried out on a considerable scale in many countries, but for various reasons little progress was made in this industry. The principal reason was that the quality of the dehydrated product, as well as the price in comparison with that of preserved and fresh vegetables, left much to be desired. Since the beginning of the present war special attention has again been devoted to this matter, and as a result of the progress made in the technical field, it has now become possible to supply a palatable product of high quality, which also possesses a high nutritive value. It is expected that costs will be brought within reasonable limits as soon as production can be undertaken on a sufficiently large commercial scale.

In our country, too, particularly good progress in this connection has been made during the past eighteen months, mainly as a result of a definite demand from the Admiralty and the Ministry of Food in Great Britain. Fortunately, the Organization has at its disposal the services of a highly qualified technical officer who is able to render active assistance to manufacturers not only in regard to the latest technical developments but also the practical problems arising from the erection of machinery.

Although the position has been made more difficult by the shortage of machinery and equipment which must generally be imported, it has nevertheless been possible to erect several factories and to equip them with locally-made machinery. The products of these factories compare very favourably with any produced elsewhere at present. Under the supervision and with the assistance of the Organization four factories are already producing dehydrated vegetables on a fairly large scale, and about five others are busy erecting the necessary plant and buildings. The production is expected to reach a total of 1,000 tons of vegetables by the end of March, 1944. This output will increase as new factories come into production and reasonable prospects for a market present themselves.

One of the main provisions laid down by the Food Control Organization in connection with this work was that quality should be maintained at the highest possible level. Only on this basis can it be hoped to keep the new industry going after the war.

The Canning Industry.

The canning industry of the Union deserves special mention because of its enormous development since the outbreak of war. The production of canned products has increased by approximately 300 per cent., and a further increase is retarded only by the shortage of

tinplate. For purposes of comparison the following production figures (in lb.) are given.

Product.	1940-41.	1942-43.
Jam	55,790,000	90,280,000
Fruit	27,680,000	24,830,000
Vegetables	4,520,000	23,400,000
Crayfish	5,680,000	5,170,000
Other fish	2,050,000	4,215,000

The tinplate hitherto supplied to the Union was specially intended for clothes, food for the Defence Forces and for the British Ministry of Food, and we were consequently placed in a difficult position in that supplies of tinned food for the civilian population had to be drastically curtailed. An attempt is being made, however, to maintain the normal supplies of jam.

During the forthcoming year the fish canning industry will receive special attention, and everything possible will be done to produce to the maximum capacity in order that the local industry can replace the canned fish which used to be imported and of which the present supplies are inadequate.

Standards for the inspection of citrus pulp, based on specifications of the British Ministry of Food, have been laid down and applied during the season. New specifications have since been issued, necessitating supervision of the manufacturing process at the factories. Arrangements have been made with the Army Food Inspection Service to carry out inspections at the factories.

In addition to the execution of the canning programme with a view to commercial and production considerations, considerable progress has been made in regard to the research side of this work. A large number of fruit varieties have, for example, been tested out by the Western Province Research Station for their drying, canning and general preservation qualities, while the Low Temperature Research Laboratory has carried out valuable research work in connection with canned vegetables, fish and the improvement of the process for making citrus pulp.

Agricultural Machinery, Implements and Requisites.

During the past year the Department once again made every effort to secure for the farming community the maximum possible quantity of machinery, implements and other requisites, without which continuation of the production process in agriculture on a proper basis would be impossible. The Controller concerned, the Director-General of Supplies and private firms all gave their active assistance in this matter.

Imports.

Imports of agricultural machinery, implements, etc., remained considerably below the normal requirements of the Union, mainly as a result of the difficult shipping position. Since the middle of the year a welcome increase in importation took place, particularly from the United States of America and Canada, but it is impossible to predict how long this improvement will continue. The cumulative effect of four successive years of subnormal importation is already making itself felt. On the whole, it may be stated that the importation of agricultural implements, machinery and spare parts during 1940 and 1941 was about 20-30 per cent. below normal, and during

1942 and the first eight months of 1943 about 60 per cent. below normal. In the case of barbed wire and baling wire, the imports during 1940 and 1941 were about 10-25 per cent. below the pre-war level, and since then they have been very much smaller. Other points of interest in this connection are the recent importation of a considerable number of cream separators and the small scale importation of tractors and spare parts.

Local Manufacture.

It is clear, therefore, that had it not been for the immense progress made with local manufacture, the present position of farmers in the Union would have been most alarming and food production would have suffered very seriously. The fact that the position has hitherto not become very grave is, therefore, largely atttributable to the success achieved in local manufacture. Whereas in 1942 the local production was less than 2,000 tons, the total last year amounted to 4,000 tons, and the total for 1943 is estimated at almost 13,000 tons which, on a weight basis, covers roughly 50 per cent. of the Union's total requirements. This quantity represents a large variety of articles manufactured at numerous widely-scattered machine factories. It does not, however, include such items as barbed wire, baling wire and piping.

It will, of course, be readily understood that up to the present local manufacture has had to be confined mainly to the simple and lighter type of article which can be turned out economically and in large quantities. Production was concentrated mainly on articles like light ploughs, cultivators, plough-shares, harrow teeth, hand hoes, sickles, horse-shoes, etc. Only a relatively small quantity of the following types of articles was manufactured during 1943, owing to the fact that a considerable number of these articles were ordered from oversea and may be expected here shortly: medium-weight double-furrow ploughs, maize planters, cutting harrows, hammer-mills, hay-rakes, wind-mills, dam scrapers, etc. The locally-manufactured articles were the result of private enterprise, except in the case of maize planters, hay-rakes and mechanical maize-threshing machines, in respect of which production was carried out in the execution of orders placed with firms by the Director-General of Supplies.

Not only was very good progress made with the manufacture of this class of article, but also with that of a large variety of spare parts, including some for tractors and engines. It is obvious, however, that it will not only be difficult but also uneconomical to manufacture all the spare parts required in the country, especially in cases where only small quantities are required.

The greatest difficulty is being experienced in connection with the manufacture of spare parts for tractors, but even in this respect satisfactory progress can be recorded. It is important to mention that the manufacture of large numbers of milk and cream cans has been successfully carried out in the country.

An important development in connection with the distribution of locally-manufactured agricultural implements, requisites, etc., is the recent establishment of a National Panel of Co-operative Societies. This organization aims at collective purchasing direct from manufacturers at factory prices by a co-operative wholesale firm which will be responsible for the handling of the goods from the time when they leave the factory until they reach the individual co-operative societies, and will in this way ensure that agricultural requisites are

obtained for members of co-operative societies at the lowest possible prices.

Wire.

All wire is under the control of the Controller of Iron and Steel, but responsibility for its distribution in so far as agricultural purposes are concerned, has been delegated to the Controller of Agricultural Machinery, Implements and Requisites.

Baling Wire.—Since March 1943, Iscor has been manufacturing baling wire, and about 1,700 tons have already been promised by the Controller of Agricultural Machinery, Implements and Requisites to appointed wholesale distributors for sale to farmers, with the aid of retail distributors where necessary. The bulk of the wire, however, was consigned direct from Iscor to the most important feed-producing areas. About 220 tons of baling wire are made available per month, while the country's present requirements are estimated at 350 tons or double the pre-war quantity. This fact emphasizes the necessity for the exercise of the greatest economy on the part of farmers in the use of baling wire. Farmers can make a valuable contribution in this direction by utilizing the same wire several times..

The prices of baling wire manufactured at Iscor have been fixed by the Price Controller. These prices vary according to thickness, and are 32s. to 34s. 6d. per 100 lb. from wholesaler to retailer, and from 35s. to 37s. 6d. per 100 lb. from retailer to farmer (all quotations f.o.r. Iscor).

Barbed Wire.—Through the instrumentality of the Food Controller, several quantities of black barbed wire (a total of 2,700 tons so far) have been obtained from the Department of Defence since March, 1942 and this wire was made available to farmers by the Controller of Agricultural Machinery, Implements and Requisites with the assistance of certain wholesale distributors. The demand far exceeded the supply, however (up to the end of August applications for 3,900 tons were received) and the distribution was, therefore, regulated under a permit on an economic basis. No permit is granted except in cases where the wire is urgently required for essential needs. In this way about 4,000 farmers in all parts of the country were assisted with small quantities of barbed wire. The price of this ungalvanized black barbed wire to the farmer is about 20s. per roll of 260 yards.

In view of the heavy demand and the fact that it will probably not be possible to obtain further supplies from the Department of Defence, arrangements have been made for the importation of a considerable quantity of barbed wire. It is expected that in the near future Iscor will also manufacture smooth wire for fencing purposes.

Binder Twine.

In order to cope with the extremely difficult position with which the country was faced during the 1942-43 wheat-threshing season the application of stringent control over distribution was necessary. Had it not been for the timely measures instituted in this connection, many wheat farmers would have found themselves in a very difficult position.

During 1942-43 altogether 68,300 bales of binder twine were sold to farmers. In view of the expected increase in the output of winter cereals during the coming season, the country's requirements in respect of binder twine for 1943-44 are estimated at 95,000 bales. In order to meet this large demand, everything possible is being done

at present to expand local manufacture. The position has also been safeguarded by the recent arrival of a substantial quantity of twine which had been ordered from oversea last season, but could not be delivered.

Jute Materials (Grain Bags, Wool Bags, etc.).

For some time now the supply position in regard to these materials has been difficult. It is felt that the only way in which to cope with the position is to institute a collective purchasing scheme, which would reduce the risks attached to individual importation. The normal importers of jute materials have created a panel for this purpose, but owing to various difficulties found that they were unable to import under prevailing conditions. Consequently, the Government intervened and decided to undertake the purchase of the country's jute requirements itself. No decision has as yet been made with regard to the channel of distribution.

Provision of Fertilizers.

In view of the fact that still greater difficulties were experienced in connection with importation, the fertilizer position on the whole did not improve, and it was necessary to intensify the rationing system which was commenced during the previous year. Throughout the year, however, special efforts were made to secure as much shipping space as possible, particularly for our requirements of rock phosphate, but although a certain measure of success was achieved, it was not possible to import nearly enough fertilizer to satisfy the country's requirements.

Phosphates continue to be our most important fertilizer, especially in the form of superphosphate. It was estimated that during 1943 about 195,000 tons of superphosphate would be available, of which, after other requirements had been met, approximately 160,000 tons would remain for allocation to European farmers. Since there was a demand for more than 400,000 tons of super-equivalent, it will be realized that there was a serious shortage, and permits had therefore to be issued under the rationing system on a considerably smaller basis than that for the previous year. Consequently, the allocations fluctuated between 25 per cent. and 50 per cent. in accordance with the importance of the crop, and it was unfortunately even impossible to make any allocation for fruit. Although it was possible during the first half of the year to supply the fertilizer for which permits had been issued, it appeared in June that the flow of phosphate rock had decreased to such an extent that the allocations could not be executed in full. Consequently, it was clear by the end of August that the provisional allocations made for October to December would have to be reduced.

In so far as *nitrogen* is concerned, the fertilizer trade succeeded during the second half of 1942 in making arrangements for the importation from Angola of 5,000 tons of fish meal at a reasonable price. During August 1942 appreciable quantities of Chile saltpetre were also imported. In order to meet the balance of our nitrogen requirements, it was necessary to import about 12,000 tons of ammonium sulphate. Unfortunately, it was not possible to import this amount, but as a result of special arrangements 5,000 tons were nevertheless imported up to June 1943. Of the balance, a further small quantity was subsequently imported, but the 6,000 tons expected early in 1944 consist for the greater part of the unimported

surplus of 1943. Owing to the irregular and inadequate supply of nitrogenous fertilizer, it was therefore impossible to allocate this kind of fertilizer separately for ordinary farming purposes. After provision had been made for the requirements of citrus and special crops like sugar-cane and tobacco, only sufficient remained to enable the trade to meet the demand for mixed fertilizers.

It is necessary here to refer to the complaints of farmers who wanted superphosphate but were unable at times to obtain it, and had consequently to take a much more expensive mixture in order to have fertilizer in time. Although numerous complaints of this nature were received, the fact must be emphasized that these farmers represent an insignificant percentage of the 40,000 farmers who received fertilizer permits. It will be understood that it was impossible on the strength of the available data to organize matters in such a manner that every farmer could procure the particular type of fertilizer allocated to him. It was arranged with the fertilizer trade that only 30 per cent. of the phosphates could be used for the manufacture of mixtures, and this figure was fixed because it more or less represented the pre-war position and because the applications from farmers justified it according to the estimates. As a result of the irregular supply and the seasonal nature of the demand for various fertilizers, however, there were times when many orders for superphosphate could not be executed, while on occasion, although to a lesser extent, certain mixtures could also not be provided. It is expected, however, that with the additional information now available, the Controller of Fertilizer will be in a position to make better arrangements for 1944.

The fullest use was once again made of the *guano* collected on the State guano islands. The year was fairly favourable and the output comparatively large. As usual, the demand exceeded the supply by a hundred thousand bags, but the guano contributed considerably towards supplementing the shortage of fertilizer. Nevertheless, its issue had to be confined to wheat, vegetables, onions and potatoes. Owing to an increase in collection and distribution costs, the net price of guano to the farmer was increased from £6 to £7 per ton, but this price is, of course, still very low in comparison with the exceptionally high fertilizing value of guano.

Good progress was made during the year with the exploitation of local fertilizer sources, and the Langebaan factory reached the production stage in August. It is estimated that the production will be 3,000 tons per month, but since considerable difficulties are still expected, particularly in regard to the best conditions for the utilization of milled rock, its sale on the open market and by agents is not recommended for the present, and arrangements have been made with manufacturers for a limited distribution to be made to State departments, institutions and co-operative societies who are requested to report on the product. It is intended also to arrange for the distribution of this milled rock under a permit from the beginning of 1944.

The scheme for the payment of a subsidy of £1 per ton on approved fertilizer was continued, and for the year ended 31 August 1943 the State paid out an amount of approximately £270,000 under the scheme.

The campaign for the *making of compost*, both by farmers and municipalities, was vigorously continued. Owing to the shortage of fertilizer, the manufacture of compost is very necessary, and it

is gratifying to note that good progress is being made in this direction. There is also a large demand for *Karroo and kraal manure,* and farmers are utilizing this product to an ever-increasing extent, but considerable difficulty is being experienced in obtaining adequate transport facilities. The possibilities for the fixation of the prices of Karroo and kraal manure are being investigated by the Price Controller.

The prospects for 1944, especially in regard to phosphates, appear to be considerably better than in 1943 since there is a probability that arrangements will be made for shipping from Morocco. Nevertheless, the supply will be much lower than the total demand, and rationing will have to be continued.

Guidance to Farmers and Consumers.

Once again the Publicity Section has made an important contribution to the activities of the Food Control Organization and has carried out very valuable publicity work for the benefit of producers and consumers in these times when advice and guidance in regard to a number of matters are so very necessary. Broadly, it may be stated that further attention has been given to the functions and aspirations outlined in the previous report. In other words, through the medium of the press and the radio and through personal contact, every effort is being made to keep producers and consumers abreast of new developments, and to give guidance in respect of economical utilization and efficient production. Attention was concentrated mainly on publicity work for the benefit of producers while that in the interests of consumers was not altogether effective. Consumers did not, however, always appreciate what was being done on their behalf and the Organization was sometimes severely criticized by certain consumers.

In so far as farmers are concerned, there is in the first place the *personal contact.* Upon the introduction of food control it was decided to visit all important food-producing parts of the Union with a view to furnishing information to producers and consumers in regard to food problems. These visits have now for the greater part been completed, but meetings are still being arranged in parts where they are deemed necessary. Experience has proved that personal contact is of the utmost value and was consequently one of the decisive factors in the success achieved in the whole campaign for the stimulation of production.

In this connection the extension service of the Department played an important rôle. Extensive propaganda was made by means of visits to farms, lectures on farmers' days and coöperative demonstrations for increased production with the least possible impairment of soil fertility and, consequently, without soil erosion. Particular emphasis was laid on the necessity for—

(*a*) rational production through sound farming practices, better cultivation and weed control;

(*b*) the manufacture and utilization of municipal and farm compost to supplement the shortage of fertilizer to a certain extent and to counteract the deterioration of soil fertility; and

(*c*) the cultivation of fodder crops, especially perennial grass pastures, dryland lucerne and legumes, and drought resistant feed varieties.

In consequence of this work grass pastures are being established on a much larger scale, and good progress is being made with the provision of feeds for animals. These activities have already had a beneficial effect on the production of animal products, and there has also been a considerable decrease in stock losses.

Very useful work has also been carried out through the medium of the *radio service and the publicity series*. The usual talks are broadcast on Tuesdays and Fridays at 6.50 p.m., and a special talk to housewives in connection with nutrition and the preparation of food is broadcast every Wednesday at 12.30 p.m. by the Dietitian of the Food Control Organization. Subsequently reprints of these talks are sent out regularly three times a week in the form of a publicity series to the press, farmers' organizations, public bodies and certain members of the public. This form of propaganda is further extended by officers of the Department who disseminate the information as much as possible in their particular areas. During the year 150 broadcast talks were issued on a large variety of subjects, all of which had a direct or indirect bearing on matters relating to food.

The *written word* also contributed its share towards the dissemination of information among farmers and consumers. Information of immediate importance is handed over to the Departmental *press service* for publication in the form of statements to the press and agricultural journals, 43 such statements having been issued during the year. In addition, considerable use was made of *Farming in South Africa*, the monthly journal of the Department, for imparting information in regard to food matters. In addition to the usual articles on this comprehensive problem, special issues were devoted to food control. The October 1942 issue, for example, was specially devoted to crop-production in the summer-rainfall area, the March 1943 issue to agricultural matters in the winter-rainfall area, while the June issue was devoted exclusively to pomiculture, and the September issue to soil fertility. These special issues were extremely popular because the interests of one group of producers were dealt with in the minutest detail in a single volume which will therefore always be useful for reference purposes.

Apart from the information imparted by the Home Economics Officers of the Department and by the Dietitian of the Food Control Organization in regard to food matters, there is also the work of the Nutrition Committee. This Committee gave special attention to the drawing up of a qualitative food plan for an adequate cheap diet and a quantitaive diet scale for the various members of the family. The food plan, as well as the diet scale, were submitted to the National Nutrition Council, and its publication has already been approved.

The Position of the Most Important Food Products.

A brief survey is given below of the main facts in regard to the developments which have taken place during the past year in connection with the most important food products. From this it will be clearly seen that the Food Control Organization and the various control boards have done their utmost to arrange matters in such a way that the interests of both consumers and producers are served to the best advantage.

Maize.

The 1941/42 Maize Crop.—The 1941/42 maize crop was approximately 16,000,000 bags, but fortunately there was a small carry-over from the previous season.

Prices to the producer at the centre of delivery according to agreement were fixed at the beginning of the season, i.e., on 1 May 1942 at 15s. per 200 lb. delivered in bags for grades 2, 4 and 6; 14s. 10d. for grades 3, 5 and 7; and 14s. 8d. for grade 8. For maize in grain elevators the prices for the various grades were fixed at 9d. less per 200 lb. than those for maize in bags.

In view of the shortage which reached a critical stage at the end of the marketing year as a result of the short crop, together with an increase in consumption due to abnormal circumstances prevailing in the country, it was decided to raise the fixed producer prices as from 19 March 1943 by 1s. to 16s. per bag. It was hoped that this would act as an incentive to producers to place the new crop, which was comparatively well advanced, on the market early and also to bring the maize still on the farms into circulation. Furthermore, it was decided to take in maize with a moisture content in excess of 12½ per cent. for a limited period and to pay for it according to the full weight delivered. This encouragement to producers unfortunately did not have the desired effect, namely, to make maize available to consumers at an earlier date, as heavy rains started to fall in March and April and greatly delayed harvesting operations.

Although an increased price was paid to the producer in respect of maize delivered after 19 March 1943 no change was made in the consumer's prices. Up to 30 April 1943 the maximum consumer's prices were as follows:—

FOR MAIZE (*Free on rail sender's station*).

	Nos. 2, 4 and 6.	Nos. 3, 5 and 7.	No. 8.
	s. d.	s. d.	s. d.
100 bags or more	15 7	15 5	15 3
99 to 21 bags	15 10	15 8	15 6
20 to 6 bags	16 1	15 11	15 9
5 to 2 bags	16 4	16 2	16 0
1 bag	16 7	16 5	16 3

FOR MAIZE PRODUCTS (*Delivered free on rail buyer's station*).

	30 bags and more.	29 to 11 bags.	10 to 6 bags.	5 to 2 bags.	1 bag.
	s. d.	s. d.	s. d.	s. d.	s. d.
No. 1 fine granulated mealiemeal	18 0	18 4	18 8	19 0	19 6
Unsifted granulated mealiemeal	17 6	17 10	18 2	18 6	19 0
Unsifted other than granulated Mealiemeal	17 0	17 4	17 8	18 0	18 6
Sifted crushed mealies	17 3	17 7	17 11	18 3	18 9
Unsifted crushed mealies	17 0	17 4	17 8	18 0	18 6
Samp	23 6	23 10	24 2	24 6	25 0
Mealie rice	23 6	23 10	24 2	24 6	25 0
Maize germ meal	11 6	11 10	12 2	12 6	13 0
Hominy Chop	10 0	10 4	10 8	11 0	11 6

Provision has been made for an increase of 1 penny per bag per month on the above consumer's prices as from 31 August, 1942.

On 19 February, 1943, all registrations of traders who were authorised to buy from producers were cancelled, and the Mealie Industry Control Board by virtue of the powers vested in it by War Measure No. 20 of 1942 itself bought maize from the producers through agents in order to obtain physical control over the maize. Since the Mealie Industry Control Board was the sole buyer of elevator maize as from 1 May, 1942, and, furthermore, since it took over all unsold supplies of maize from coöperative societies on 1 September, 1942, by far the greater part of the available maize stocks at this stage, i.e., during the months of February, March and April, was under the direct control of the Mealie Control Board. The Board could therefore ensure that an equitable distribution of these stocks would take place throughout the country.

Although the prospects in regard to the new crop were good, the Food Controller considered it advisable to reduce the issue of permits to consumers, in order to ensure that available stocks would not be consumed before the new crop became available. In this process of rationing account was taken in the first place of the requirements for human consumption, and gradually diminishing quantities of maize were made available for the feeding of animals until as from 1 March, 1943, no maize at all could be released for feeding purposes. Stock owners were advised to use other cereals and green feeds, and they were also assisted by the lifting of the permit restrictions on the purchase of bran, germ meal and hominy chop. Rations for human consumption had also to be reduced, but maize rations, especially in the case of natives, could be supplemented with potatoes, beans and other kinds of vegetables.

In order to reduce the wastage of valuable human food to a minimum, the sifting of bran in the preparation of mealiemeal was prohibited. It was also made compulsory that a certain percentage of yellow mealiemeal should be mixed with white mealiemeal in order to make stocks of yellow maize available for human consumption. The percentage to be added was first raised from a minimum of 10 per cent. and a maximum of 25 per cent., to a minimum of 25 per cent. and a maximum of 40 per cent., and later to a maximum of 50 per cent.

Disposal of the 1942/43 maize crop.—The 1942/43 maize crop showed a considerable improvement on that of the previous year. In pursuance of the policy to compensate the farmer for increased costs, the producer's price was fixed at 16s. per 200 lb. in bags for grades 2, 4 and 6, 15s. 10d. for grades 3, 5 and 7, and 15s. 7d. for grade 8. For maize delivered in elevators the prices for the various grades were again 9d. lower per 200 lb. than those for maize in bags.

Whereas during the previous marketing year different maximum consumer's prices were fixed for various quantities of maize and maize products, this practice was abandoned as from 1 May, 1943, and a maximum price for the various grades and kinds of maize and maize products was fixed, which left a reasonable margin for healthy competition. In the case of maize products, however, a difference was made between the prices at which millers and distributors could sell.

These maximum prices were fixed as follows:—

FOR MAIZE: (Delivered free on rail sender's station).

18s. 3d. per 200 lb. for grades 2, 4 and 6.
18s. 1d. per 200 lb. for grades 3, 5 and 7.
17s. 10d. per 200 lb. for grade 8.

FOR MAIZE PRODUCTS (*Delivered free on rail buyer's station*).

	Millers.	Distributors.
	s. d.	s. d.
Fine granulated mealiemeal	18 7	20 1
Unsifted granulated mealiemeal	18 0	19 6
Unsifted other than granulated mealiemeal	17 7	19 1
Sifted crushed mealies	17 10	19 4
Unsifted crushed mealies	17 7	19 1
Samp	23 8	25 2
Mealie rice	23 8	25 2
Germ meal	11 6	13 0
Hominy chop	10 0	11 6
Mealie bran	6 2	7 8

In the case of maize products the prices were increased by 6d. where these products were sold in the Cape Province, Natal and certain districts in the Transvaal. Provision has again been made for an increase of one penny per bag per month on the above consumer's prices for both maize and maize products as from 31 August, 1943.

In regard to *seed maize* which is an important factor for a good crop during the coming season, a producer or maize is allowed to sell seed maize to another producer at a minimum price of 18s. 6d. per bag. The seller must obtain a permit from the Mealie Industry Control Board and the purchaser of seed maize similarly requires a permit from the Board for the purchase of more than two bags of seed.

During the new marketing year the Mealie Industry Control Board continued to operate as sole buyer of elevator maize. At first, as the result of the delayed reaping, the Board was also the sole buyer of maize in bags from producers, but as from 1 July, 1943, traders were again registered to operate as direct buyers from producers on their own account. An agreement has, however, been reachde with coöperative societies to purchase maize on behalf of the Mealie Industry Control Board from the beginning of the season. The aim is to allow consumers to take up the maize marketed through the ordinary channels of trade before the Board makes its stocks in elevators and in coöperative stores available.

By exercising physical control over available stocks, the Food Controller and the Mealie Industry Control Board are able to eliminate the possibility of maldistribution. Furthermore, it is essential that every effort should be made to husband available supplies as far as possible and so build up a reserve from which the following crop can be supplemented. A permit system has once again been instituted, and no person may buy more than two bags of maize or maize products per month except under a permit. The quantities allocated for human consumption and for stock feeding purposes each month are ample, and although the primary consideration is to meet all direct requirements for human nutrition, adequate quantities are also made available for the production of essential protective foods such as dairy products, fresh milk, eggs and bacon. Maize is also made available for draught animals used for essential services, and for manufacturing purposes.

In order to encourage the production of maize during the coming season, the Government has announced that, whatever the size of

the crop may be, the producer will receive a price of 16s. per bag for the best grades. This announcement should undoubtedly have a stimulating effect on maize production, and if climatic conditions are favourable, there is reason to believe that the next crop, supplemented with the reserve which, it is hoped, it will be possible to carry over, will be sufficient to meet the country's requirements.

Wheat.

The 1942/43 wheat crop was the second largest in the history of the Union, and was exceeded only by that of 1935/36. The final crop estimate fixed the figure at 5,640,000 bags, but in consequence of the extraordinarily good yield in the Orange Free State, 6,114,200 bags were threshed, according to the threshing-machine returns received by the Wheat Board up to 21 August, 1943. The yield in the Orange Free State up to the same date was 2,562,918 bags—the largest crop in the history of that province.

Despite the good wheat crop, it was in the national interest to continue the measures instituted in April, 1941, for the conservation of wheat. The country's wheat consumption has increased enormously in the past few years. Whereas originally the conservation measures reduced the quantity of wheat required by 16 per cent. on the quantity milled during 1938/39, the consumption increased by 7 per cent. during the year 1941/42, and by a further 19 per cent. during the past year. This increased consumption must be ascribed to the general prosperity of the country, the large inland military requirements and the increased population. The maize shortage which prevailed for a few months at the end of 1942, and during the first part of 1943, also contributed considerably towards the increase in consumption during the past year. The result of this increased consumption is that the crop is just sufficient to meet the country's requirements, and it was not possible to relax the wheat conservation measures. In order to supplement the supply, provision was made for the importation of wheat, and a few shipments were received. In consequence of the large crop and the importation, it was fortunately possible, in spite of the increased consumption, to maintain the reserve with which the year was commenced and in this way to safeguard the country's bread requirements to a certain extent. Steps have already been taken for the further importation of wheat in the coming year, in order to maintain the country's supply position on a sound basis.

The distribution of the last wheat crop presented considerable difficulties, but owing to the effective control which was applied, these difficulties were overcome. As a result of the copious rains, the threshing, and consequently also the delivery, of the crop in the north-eastern Cape Province and the Orange Free State was considerably delayed—in many cases for about two months. Thanks to the carry-over, however, it was possible to keep the mills in the northern provinces going without transporting wheat from the Western Cape Province to the Transvaal and Natal, and subsequently to consign wheat from the Orange Free State to the Cape. For the first time the Union's crop in the north exceeded the requirements of the northern provinces (as a result of the large Free State crop), while that of the Western Cape Province was inadequate for the requirements of the south. As a rule, the Transvaal and the Free State crop must be supplemented with Cape and/or imported wheat in order to meet the needs of the mills in the north. During

the past season the Cape crop was barely sufficient to meet the local requirements and had to be supplemented with the imported wheat. As a result of the control it was possible to cope even with this exceptional state of affairs and to eliminate the unnecessary transport to and fro and the costs which this would necessarily entail.

The prevailing war conditions are gradually making their influence felt to an increasing extent in the wheat industry. In the previous report mention was made of the fact that the Wheat Board, in collaboration with the Maize Board, was authorized to import grain bags to meet the requirements of their respective industries. Consequently, there were sufficient grain bags even for the unusually large wheat crop. The position as regards grain bags for the coming crop is also extremely satisfactory, and practically all the grain bags required by the wheat industry have already arrived and have been distributed by the Wheat Board according to the requirements of the various areas.

As stated in the previous report, the Government announced in March, 1942, that it would request the Wheat Board to fix the wheat price for the past crop at 30s. 6d. and 30s. for Class A, grade 1, and Class B, grade 1, respectively. The Wheat Board implemented this undertaking by fixing the above prices for the past crop. The Government also decided to continue with the policy of subsidizing bread so that the selling price of a 2 lb. loaf would not exceed 6½d. To enable bakers to sell bread at this price, unsifted meal No. 1 had to be available to them at 35s. per bag. Millers in their turn could sell meal at this price only if they could purchase Class B, grade 1 wheat at 25s. 2d. per bag. The prices of other classes and grades are in proportion. It was therefore decided to subsidize the price of Class B, grade 1 wheat with 4s. 10d. per bag (other classes and grades in proportion). The Wheat Board contributed 9d. per bag to the subsidy out of its current levy fund, while the balance was paid by the Government. In reality, therefore, this subsidy on the price of wheat must be regarded as a subsidy to the consumer.

In pursuance of these arrangements the price of bread was raised to 6½d. from 1 November 1942. An investigation by the Wheat Board, however, revealed that owing to the prevailing scarcity many bakers do not use certain optional ingredients like vegetable fat, malt, sugar, etc., in the making of bread. Since an allowance has been made in the price of bread to cover these ingredients, it was consequently decided to fix the price of bread without making allowance for the above-mentioned optional ingredients, and on 5 March, 1943, the price was reduced to 6d. per 2-lb. loaf.

Upon the introduction of the standard loaf from 1 May, 1941, provision was made for a mixed meal (consisting of 95 per cent. wheat meal with the addition of not more than 5 per cent. mealiemeal, ryemeal or soybean meal), and a standard mixed loaf baked with this meal. The demand for this mixed meal and loaf was, however, very limited and, consequently, they were abolished from 5 March, 1943. All wheat meal and bread offered for sale at present are therefore pure wheaten products, and the references to mixed meal which are sometimes still heard, are based on a complete misunderstanding.

The fertilizer position necessitated the rationing of fertilizer even for the wheat industry, but in view of the special importance of wheat-growing the largest quota was allocated to this industry. Nevertheless, the decrease in the quantity of fertilizer involved the

danger that wheat farmers would sow other cereals like oats and rye which can do with less fertilizer. Consequently, the Government, on the recommendation of the Wheat Board, decided to follow the policy adopted last year of giving advance indications of the price of wheat with a view to encouraging the production of this cereal. It was therefore announced in March that the price for the coming 1943/44 season would be 36s. 6d. per bag for Class A, grade 1 and 36s. for Class B, grade 1, respectively. In fixing these prices the increased costs of agricultural requisites, labour, etc., were taken into consideration, and also the fact that, owing to the smaller quantity of fertilizer available, there would possibly be a decrease in the yield per morgen. As was the case last year, the advance announcement of prices had the desired effect, and producers sowed wheat on an extensive scale. Although everything will depend on the further course of the season, the weather conditions so far have been favourable and on the whole the wheat crop is very promising, except in a few areas like Oudtshoorn-Calitzdorp and Swellendam-Mossel Bay.

Oats, Barley and Rye.

The war was also responsible for a tremendous increase in the demand for oats, barley and rye. This is partly due to the large expansion of the local demand and also to the requirements of the army and for ships' stores. To this must be added the fact that many of these products, e.g., pearl barley, oatmeal, etc., were formerly imported in their manufactured form, and that their importation has practically ceased owing to shipping difficulties. The position has been further aggravated by the fact that the previous 1941/42 crops of these cereals were small or only of medium size, and that in addition the past 1942/43 crop, particularly that of oats and barley, was poor. These cereals are used for human and animal consumption. The demand for animal feed has increased because, owing to the scarcity of, and limitations imposed on, mechanical draught and transport power both in agricultural and in urban areas, animals are being used to an increasing extent. A further increase in the demand for animal feed has been caused by the shortage of maize. During the previous year when the supply position in relation to the demand was not so unfavourable, this led to chaos and great speculative activity in the case of rye and to a serious shortage of oatmeal (as a breakfast cereal) in the case of oats.

Since it was clear, therefore, that the yield during the 1942/43 season would be smaller and the demand much greater, the Governments decided to institute complete control over winter cereals, in order to ensure that they would be utilized for purposes dictated by national interests. With a view to the practical application of such control, producers were prohibited by Proclamation No. 284 of 6 November, 1942 (War Measure No. 124 of 1942) from delivering winter cereals to any person other than the Wheat Control Board.

The regulations also empower the Minister to fix the grades, as well as purchase and selling prices, of barley, oats and rye. In the case of rye, provision was also made for the fixation of the grades and prices of rye flour, rye meal, rye bran and rye bread, and for the control of the sale of rye meal and rye flour. The grades of barley, oats, rye, rye flour, rye meal, rye bran and rye bread were prescribed by Government Notice No. 2377 of 20 November, 1942, and the prices of the above-mentioned products by Notice

No. 2378 of the same date. The sale of rye meal and rye flour, except under a permit issued by the Wheat Control Board, is prohibited by Government Notice No. 2379 of the same date. The sale of oatmeal is not controlled, and only maximum prices were fixed by the Price Controller.

Barley.

The buying prices of barley were fixed as follows:—

Class A (first firade) six-row malt barley, 18s. 6d. per bag of 150 lb. net.

Class B (first grade) two-row malt barley, 17s. 6d. per bag of 150 lb. net.

Class C (feed barley), 15s. 6d. per bag of 150 lb. net.

Class D (first grade) barley-wheat, 22s. 6d. per bag of 200 lb. net.

The prices of the lower grades of the various classes were fixed in proportion. The above basic selling prices were increased by 7d. per bag in the case of Classes A, B and C (of which 5d. covers the agent's commission and 2d. the Wheat Board's administration costs) and 9d. per bag in the case of Class D, of which 6d. went to the agent and 3d. to the Wheat Board. To cover storage costs, the prices were increased from 1 April in the case of Classes A, B and C by 2d. per bag, and in the case of Class D by 3d. per bag per month.

The Wheat Board purchased 232,478 bags of barley. Against this, the requirements were as follows (in bags):—

Malt (breweries)	189,000
Malt and yeast (malt meal for bread, etc.)	18,600
Pearl barley	57,820
Seed	25,000
Feed	50,000
TOTAL	340,420

For obvious reasons it was decided that the country's seed requirements should be fully met, and also its requirements in respect of malt, meal and yeast. The latter is regarded as essential in view of its importance in the making of bread. The allocation for beer was reduced to 160,000 bags, but owing to the inadequate supplies of Classes A and B (malt barley) only 118,593 bags could be delivered. For pearl barley the allocation was fixed at 49,820 bags, but only 42,675 bags could be delivered. Feed barley (Class C) was sold as part of the poultry-feed ration, which was instituted for the months March to June when maize was not available.

It is difficult to venture any predictions in regard to the coming crop. In some parts, as for instance in the Transvaal and the Worcester-Robertson area, conditions at present are good; in other parts, on the other hand, particularly the Swellendam-Riversdale area, conditions are very bad. The general indications are that there will be a smaller barley crop.

In March an advance announcement was given that the price of Class C, grade 1 (feed barley) would be the same for the coming season as for the past season, namely, 15s. 6d. per bag. The price of Class A, grade 1 (six-row malt barley) will be raised from 18s. 6d. to 20s., and the prices of Class B two-row malt barley and the other grades of the various classes in proportion.

Oats.

The purchase price of oats was fixed as follows:—

Class A (grade 1): 16s. per bag of 150 lb.
Class B (grade 1): feed oats, 15s. 6d. per bag of 150 lb.

The prices for the lower grades of the two classes were fixed in proportion. As in the case of barley, the basic selling prices were increased by 7d. per bag, of which 5d. goes to the agent and 2d. to the Wheat Board. In addition, the prices were increased by 2d. per bag per month from 1 April 1943, to cover storage costs.

The Wheat Board purchased 494,674 bags of oats. The requirements are as follows (in bags):—

Seed	110,000
Human food (oatmeal)	359,000
Animal feed	400,000
	869,000 bags.

In this case, too, it was decided that the seed requirements should be fully met, and 295,000 bags were allocated for human consumption. As a feed, oats were made available for horses and mules only, and the quantity made available was strictly rationed. It was even necessary, when the position was extremely critical and the extent of the deliveries from the Orange Free State were unknown, to suspend the sale of oats as an animal feed completely for a few months.

As regards the oats sold for seed, it must be emphasized that oats were utilized for green grazing in the north-eastern Cape, the Orange Free State, eastern Transvaal and Natal. The oats are not harvested and it would, therefore, be erroneous to deduce from the seed sales that, on the whole, more oats were sown for harvesting purposes.

Of the 494,674 bags of oats purchased by the Wheat Board, 210,274 bags, i.e., almost half, came from the Caledon-Mossel Bay coastal area. Unfortunately, the crop prospects for the coming season are very poor in a large part of the area, particularly from Swellendam to Mossel Bay. In other parts of the country the position is fair, but owing to the poor conditions prevailing in a large part of the main production area, it is very doubtful whether even good crops in the other parts will offset the small crop of this area. In March 1943, it was announced that the prices of oats for the coming (1943-44) crop would be the same as for the past crop.

Rye.

The purchase price of first-grade rye was fixed at 23s. 6d. per bag of 200 lb. and that of the lower grades in proportion. The selling price was 9d. higher, of which 6d. went to the agent and 3d. to the Wheat Board. The prices were raised from 1 April 1943, by 3d. per bag per month to cover storage costs. The prices of rye flour and rye meal in wholesale quantities were fixed at 43s. 3d. and 37s. 11d. per bag of 200 lb. net, and rye bran at 7s. 6d. per 100 lb. The prices of smaller packings and retail quantities are in proportion. The minimum and maximum prices of first-grade rye bread (made of rye flour) were fixed at 7d. and 7¾d. per 2-lb. loaf, and those of second-grade rye bread (made of rye meal) at 6½d. and 7¼d., respectively.

Rye is used:—

(*a*) as seed, with a view to rye production, and also for winter grazing in the summer rainfall areas;

(*b*) in the form of rye flour for industrial purposes, as in the manufacture of matches, for the binding of books and the making of cardboard and paper containers;

(*c*) in the form of rye flour and rye meal for rye bread and confectionery;

(*d*) as an animal feed.

The first two uses must be regarded as essential, and it was decided that the requirements for these purposes should be fully met. In order to supplement the use of wheat for human consumption, it was decided to make rye available for bread. When, however, it became necessary from March 1943, to suspend the use of maize for animal feeding, it was decided also to make rye *inter alia* available for the feeding of horses, mules and pigs. It subsequently appeared that the supplies were more than adequate for these purposes and that there was a surplus which could be used for rye bread and confectionery. Consequently, from May 1943, rye was once again supplied to millers for the milling of rye flour for sale to bakers and others. The sale of rye flour is subject to a permit.

The Wheat Board purchased 152,385 bags of rye, and up to 31 August 1943, the rye sales were as follows:—

	Bags 200 *lb.*
Seed	18,271
Feed	48,915
Milling (Industrial purposes, bread and confectionery)	63,770
	130,956

On the whole, the prospects for the new crop are fair, and a crop of more or less the same size as that of last year is expected. It was announced last March that the prices of rye for the coming (1943-44) crop would be the same as those for the past season, viz., 23s. 6d. per bag of first-grade rye—lower grades in proportion.

The control instituted over oats, rye and barley has proved a great success, and will be continued.

Groundnuts.

The 1942-43 groundnut crop amounted to approximately 200,000 bags as compared with 90,000 bags during the previous season. The measures instituted during the previous year by the Food Controller for the purchase of the groundnut crop in order to conserve sufficient seed contributed in no small measure to the size of the crop. Nevertheless the crop was too small to meet the local demand which is estimated at 280,000 bags (unshelled), quite apart from the requirements of the oil-expressing industry. It is estimated that since the outbreak of the war the local consumption has risen from 60,000 to 280,000 bags (unshelled), mainly as a result of the increase in the consumption of peanut-butter, the fact that certain dried fruits which were previously imported are no longer available, the convoys which touch at Union ports, and the consumption in the various military camps in the Union.

The Food Controller did not purchase the 1942-43 crop, as in the case of the 1941-42 crop. The greater part (approximately 95 per cent.) of the crop was handled by co-operative societies at the same prices which prevailed last season. Producers received an advance payment of 18s. 4d. per 100 lb. for grade 1 (unshelled), and it is expected that an arrear payment of roughly 3s. per 100 lb.

will be possible. This means that producers will receive about 21s. per 100 lb. for grade 1 (unshelled).

Potatoes.

This is one of the products in respect of which production was greatly stimulated by the war demand and the substantial general price improvement which has set in since the outbreak of the war. Consequently, the summer production of potatoes during the past year was appreciably greater than that of the previous year. The effects of this were keenly felt on the various markets of the Union, and at times the supply exceeded the demand.

For many producers potato production was a new undertaking, and, owing to lack of experience, incorrect methods of cultivation were practised on a considerable scale, with the result that in many cases the quality left much to be desired. The outcome of this was that as soon as potatoes were mature, they were sent to market without being properly graded. By January last year considerable glutting of the markets had taken place and prices declined appreciably. Later in the season prices improved, but at the end of the season August-September another decline set in. This decline is mainly attributable to the fact that many highveld farmers tried to withhold their potatoes in the hope of obtaining better prices later in the year, while the Free State farmers, owing to a shortage of labour and the heavy rains during the normal lifting period, were not able to lift their crops in time. Consequently, the potatoes which reached the market were of low quality.

It may also be mentioned here that during the serious maize shortage the mines and other large employers were requested to utilize potatoes instead of maize for the feeding of their native labourers. Owing to the native's preference for a maize ration, however, this step did not result in the absorption of large quantities of potatoes. Stock-farmers, particularly pig and dairy farmers, also utilized potatoes as a feed for their animals during the above-mentioned period.

Since October 1942, the Purchasing Section of the Food Control Organization has acted as supplier to all military camps in the Union and South-West Africa. In addition, potatoes were purchased for ships' stores and also on behalf of neighbouring states, as well as for Kenya. Purchases were mainly confined to the markets, but were also made from individual farmers, and the relative quantities were consigned direct to the ports.

The total quantity purchased for the various purposes was 567,330 bags and the total sum paid was £516,189.

Onions.

The onion crop in the western Cape Province this year was, on the whole, poorer than that of the previous year, and prices remained higher throughout.

Once again the Food Controller followed the policy of allowing prices to fluctuate as little as possible, and with this object in view the Purchasing Section operated on the market and also purchased onions from farmers. Since the end of July all military camps have been placed on half ration, owing to the limited supplies of onions. This measure had the desired effect, and the onion crop of the western Cape Province was sufficient to meet all requirements until the new Transvaal crop came on the market.

Rice.

Prior to, and at the beginning of, the war the Union normally imported about 87,000 tons of rice per annum, and at least 98 per cent. of this quantity came from countries like India, Burma, Siam, Indo-China and the Dutch East Indies. With the entry of Japan into the war and the consequent conquest of most of these territories, the rice supplies available to the allied countries were seriously curtailed, and although it was still possible during the first part of 1942 to secure appreciable quantities from India, practically no supplies have been received from this source since the beginning of 1943 owing to local emergency conditions. The only remaining sources are South America and, to a lesser extent, the north and west African territories. The quantities procurable from these areas are, however, very insignificant in comparison with the pre-war imports, and it is, therefore, clear that, until the war is over, the people of the Union will have to content themselves with very little or no rice at all in their normal diet.

It is realized, of course, that a shortage of rice causes considerable inconvenience to certain sections of the population, but fortunately the position in regard to supplies of other foodstuffs which may be substituted for rice is such that the rice shortage need not cause serious hardship.

In order to ensure the most effective utilization of the small quantities which are available for the Union, it was decided to take over full control of the importation and distribution of rice from the beginning of 1944. The Food Controller will undertake this task in coöperation with the trade, more or less on the same basis as that which is applicable in the case of tea. Although the proposed steps will contribute towards a more proportionate distribution, the position will remain difficult owing to the shortage of supplies.

It is also hoped that it will be possible to provide rice at a lower price level than that prevailing at present. At the existing high prices, which must be ascribed primarily to the excessively high freight from South American countries, rice cannot be used to advantage by the less privileged sections of the population. If, therefore, the price level cannot be considerably reduced, the importation of this foodstuff will probably not be worth-while.

Meat.

In consequence of the sharp increase in the prices of slaughter-stock, the Government decided in October 1942, to entrust the fixation of the maximum wholesale and retail prices of beef and mutton to the Price Controller. It was not considered practicable to fix the producers' prices for cattle and sheep as well. The Price Controller, however, published a list of "indicated" prices, which the producer would receive for his cattle and sheep on the basis of the wholesale prices fixed for meat.

Price fixation was originally applied only in the most important consumption centres, viz., Johannesburg, Cape Town, Durban and Pretoria. This course was necessitated mainly by the shortage of properly trained meat-graders. Although the authorities were fully alive to the difficulties which could arise as a result of confining price control to the few large centres and leaving prices in the rest of the country uncontrolled, it was expected that price control in the centres concerned would exercise a stabilizing effect on the prices of slaughter-stock and meat throughout the country.

Unfortunately, this expectation was not realized. Slaughter-stock prices in the uncontrolled areas soared to heights considerably above the indicated level for the controlled markets, with the result that a shortage of supplies arose on the controlled markets. In order to draw supplies, butchers in the controlled areas were compelled to offer prices which could compete with those in the uncontrolled areas, and this in turn, led to dissatisfaction on the part of wholesale and retail butchers in the controlled areas. In order to safeguard themselves against losses in respect of the high prices paid for slaughter-stock, some of these butchers indulged in "black-market" activities on a considerable scale.

After prosecutions instituted by the Price Controller, an agreement was reached at the end of May 1943, between butchers and auctioneers on the Johannesburg market in regard to a system of selling on a basis of live weight and grade at prices which corresponded approximately to the indicated prices. The grading of livestock was undertaken by two persons—one representing the butchers and the other the auctioneers. The Food Controller gave his consent to this experiment, subject to certain definite conditions for the protection of the interests of the producers. At first, however, grading of livestock proved most unsatisfactory in so far as sellers were concerned, and sales by auction at fixed prices virtually became a farce. It very soon became evident that this scheme was a failure, and although selling by auction on a basis of live weight and grade was continued for a short while, the practice of selling to the highest bidder was again followed.

With a view to effecting a more proportionate distribution of the available cattle, the Meat Control Board meanwhile instituted a rationing system in respect of slaughterings by butchers.

In the second half of July 1943, the fixed wholesale and retail prices of beef and mutton were increased. In the case of beef the prices for the higher grades were raised by about 5s. per 100 lb. above the prices fixed in October 1942, while those for the lower grades were placed on about the same level as those of October 1942. The scarcity of cattle, however, continued in the controlled areas, and prices remained considerably above the indicated level. After further prosecutions by the Price Controller, butchers refused in August to buy cattle except on a grade and weight basis at the indicated prices. Auctioneers would not concede to this, with the result that a deadlock was reached and no auction sales were held for a few days. This action on the part of the trade resulted in the withholding of supplies from the market, and a serious shortage of meat was experienced in the controlled centres, especially in Durban.

At this stage the Meat Commission, appointed in terms of Government Notice No. 1381 of 30 July 1943, commenced its work. The terms of reference of the Commission were as follows:—

"To enquire into, report upon and make recommendations concerning the marketing and distribution of meat in the Union, with special reference to—

(*a*) the adequacy or otherwise of supplies of slaughter stock to meet the increased consumption needs of the country;

(*b*) the availability of such supplies and the measures to be adopted to ensure an even flow of livestock to the markets;

(*c*) the distribution of available supplies between butchers and consumers;

(*d*) the stabilization of prices to both producers and consumers and the manner in which such stabilization is to be effected;

(*e*) the advisability or otherwise of introducing changes in the existing system of livestock and meat marketing with a view to greater stabilization of meat supplies and meat prices during the emergency period."

The Commission is at present busily engaged on its investigation, and has been instructed to report as soon as possible.

At the beginning of September 1943, price control was also extended to Port Elizabeth, East London, Pietermaritzburg and Bloemfontein.

With a view to increasing the flow of supplies to controlled centres the Food Controller has arranged with the Railway Administration to make the maximum number of trucks available for the transport of slaughter-stock from South West Africa where, owing to the scarcity of trucks, considerable numbers of slaughter-cattle of good quality have accumulated. Consequently, on 30 August 1943, the Food Controller assumed control over the allocation of all slaughter-stock trucks in South West Africa and the provision was laid down that all slaughter cattle must be consigned to the Food Controller on a grade and weight basis at indicated prices. An average of roughly 3,500 head of cattle were transported per week, and up to the present over 35,000 head of cattle have been received through this channel. The military requirements were met out of these supplies and, in addition, the Food Control Organization was enabled to relieve the position by the issue of large quantities of beef for civilian consumption on the Witwatersrand, in Pretoria, Durban, Cape Town and Port Elizabeth, as well as in other centres.

Notwithstanding the measures taken, the position remained difficult and the Government was obliged in October 1943, to restrict the consumption of meat by the institution of one meatless day a week. In addition, slaughterings were rationed throughout the country, the serving of meat for breakfast (except bacon and ham) at hotels, boarding-houses, etc., was prohibited, and consumption by military camps and mines curtailed.

Since the institution of these measures the position in regard to mutton has improved considerably and prices stand almost at the indicated level. In so far as the beef position is concerned, an improvement is also discernible, but it is not yet satisfactory, particularly in Durban. Beef prices continue to be high. As a result of early rains grazing conditions are very good, and it is reasonable to expect that the supply position will show an appreciable improvement during the next few months.

The report of the Meat Commission is being eagerly awaited, and once its findings have been made available, everything possible will be done by the authorities to improve the general marketing and distribution system of meat. This ought to make a very valuable contribution towards the elimination of the difficulties experienced during the past twelve months.

The activities of the Purchasing Section during the year also included the slaughtering of the cattle which had to be destroyed in those parts of the Vryheid district which were infested with East Coast Fever. Over 8,000 head of cattle were slaughtered, and with the exception of a few truck-loads the meat from the veld abattoirs reached military camps in good condition. Appreciable quantities of this meat were also made available for civilian use in Durban and Johannesburg. Payments to farmers for the cattle were effected on the basis of the indicated prices.

Since it was possible during the months of April to August to meet the bulk of the military requirements from this source, the

Purchasing Section was able to limit its purchases on the market to small numbers. In this way it was possible to obviate a further stimulation of meat prices which would undoubtedly have occurred if it had been necessary for the Section to purchase the meat requirements of the military camps on the market.

Dairy Products.

For a considerable part of the year under review grazing conditions were favourable for the dairy industry, but the drought experienced in the greater part of the country in February 1943 had a limiting effect on production, and the shortage of concentrates (particularly maize for stock-feeding purposes) greatly hampered the industry. Fortunately, war conditions did not exercise a very adverse effect on the manufacturing side of the dairy industry. The factories were able to procure the necessary machinery, and most of the other requisites were also obtainable. The preparation of rennet, cheese colouring matter and acid neutralizing agents was undertaken by local manufacturers, and there is every reason to be satisfied with the measure of success achieved. The provision of good quality salt for butter and cheese was sometimes difficult and, on the whole, the packing of butter and cheese is not of the same standard as it was under normal conditions, while the external appearance of these products sometimes also leaves much to be desired.

Butter.

In so far as the production of butter by factories in the Union is concerned, there was a considerable improvement in that of the previous year. The total production of the Union amounted to approximately 42,500,000 lb., and that of South West Africa and the other adjoining territories to slightly more than 12,000,000 lb., an increase of over 7,000,000 lb. for the Union and other territories in comparison with 1941-42. The consumption of factory butter was about 56,600,000 lb. (ships' stores and supplies to neighbouring territories included), i.e., about 6,000,000 lb. in excess of that of the previous year, and 2,000,000 lb. in excess of the total production.

Although the Dairy Control Board imported 1,500,000 lb. of butter for sale as ships' stores and also for local consumption, the application of a system of rationing was essential. A commencement was made with this system of rationing on 21 September 1942, when rationing was instituted by the trade on a basis of 75 per cent. of the average consumption during the preceding three months. Owing to an improvement in production it was possible to reduce the restriction by half on 6 November 1942, and a week later the full 100 per cent. of the sales of June-July-August was permitted. Unrestricted sales were not possible before 1 February 1943, but on 26 May rationing had again to be resorted to, namely, on a basis of 75 per cent. of the average actual sales during January and February 1943. The supply position subsequently (i.e., from 9 September 1943) necessitated the curtailment of the ration by a further 10 per cent.

The basic butterfat price remained constant throughout the year, viz., at 1s. 6d. per lb. for first grade (second and third grade in proportion), except during September and October 1942, when the price was 1s. 5d. In order, however, to compensate producers for their additional costs and to encourage production, the Dairy Control Board paid substantial winter premiums on butterfat out of levy funds. In this connection it may also be stated that the Board made timely announcements regarding the basic price and premium,

so that producers could know in good time what they would receive for butterfat and make their arrangements for the winter period accordingly.

The Government decided to place a sum of £75,500 at the disposal of the Board in order to make good the possible deficit which might arise after payment of the winter premiums. The following are the prices, including premiums, which producers received from time to time during the year for first-grade butterfat.

September and October 1942: 1s. 10d. per lb.
November 1942 to April 1943: 1s. 6d. per lb. (no premium).
May 1943 to June 1943: 1s. 9d. per lb.
July 1943: 1s. 11d. per lb.
August 1943: 2s. per lb.

The retail price of butter remained constant during the year, viz., at 1s. 10d. per lb. for the best quality. This not only compares exceptionally favourably with the very much higher prices which had to be paid during the previous World War for butter of uncertain quality, but also testifies to the valuable contributions which control has made towarde the furtherance of the interests of the consumer.

The prohibition in regard to the use and disposal of cream which came into force in May 1942 is still operative as a measure of economy. Under this measure a producer of cream may not sell his product to any other person other than a manufacturer, and the cream may be used for the making of butter only. Exemption is granted only where a medical certificate is submitted stating that cream is essential in the diet of the applicant. The use of butter in the preparation of ice-cream and in bakeries is allowed. Thus where cream was previously used for these purposes, use is now made of butter.

There were 15 creameries which made more than 1 million lb. of butter during the past year as against 14 last year. During 1941-42 the percentage of first-grade butter as graded at the creameries was 81·8, while this year it is 85·4. This testifies to good progress. Furthermore, the percentage officially graded as first grade is somewhat better than was the case last year.

Cheese.

A total of about 16,500,000 lb. of cheese was made at cheese factories, or approximately 400,000 lb. more than last year. There was therefore no important increase in the production of cheese. This is due to the same factors which exercised a hampering effect on butter production, as well as to the fact that considerable quantities of cheese milk were absorbed by the fresh-milk trade. At no stage was there sufficient cheese in stock to permit of proper ripening of the product, and even during the most favourable period there was never more than two months' production on hand. The result was a constant shortage of cheese. The consumption was about 17,600,000 lb. in comparison with 14,600,000 lb. in 1941-42, an increase therefore of 3,000,000 lb.

Notwithstanding the shortage of cheese, prices were kept stable. From 1 February 1942 to 30 April 1943 the wholesale price was 1s. 3d. per lb. for the best quality, and on 1 May 1943 it was increased by 1d. per lb. Thus the value of control was clearly demonstrated in the case of cheese prices as well.

The basic price of cheese milk as fixed by the Dairy Control Board was 8½d. per gallon during the first two months of the year under review, with an additional premium of 1½d. per gallon; from 1 November 1942 the basic price was 9d. per gallon, with a pre-

mium of 2d. per gallon from 1 May 1943. For creameries paying according to the butterfat-content, the basic price was 1s. 11½d. per lb. butterfat during September and October 1942 and 2s. 1d. per lb. for the remainder of the report year. Winter premiums were paid out at the rate of 4½d. per lb. butterfat during September and October 1942 and 5½d. per lb. from 1 May 1943.

Milk.

On the whole the quality of the milk delivered to cheese factories was satisfactory in so far as the butterfat-content was concerned. The solids-not-fat-content, however, was disappointing in a large number of cases. This also applies to milk delivered for urban consumption. Most cheese factories pay for the milk delivered according to its butterfat-content, while some still adhere to the old basis of payment, viz., according to the quantity of milk. Generally speaking, it is increasingly being realized that payment according to quality is the most equitable basis for suppliers.

Prior to 31 October 1942 the price of *condensing milk* was not fixed by the Dairy Control Board. On 1 November 1942 however, the price was fixed at 10d. per gallon and 2s. 4d. per lb. butterfat, respectively and on 1 May 1943 these prices were raised to 1s. per gallon and 2s. 9½d. per lb. Fresh milk channels also drew appreciable supplies of condensing milk.

In point of fact, the consumption of *fresh milk* increased to such an extent that the usual source of supply, viz., the dairies and farms in the immediate vicinity of the cities, could not meet the demand, and the large population centres were dependent for their supplies on places situated 200 miles or more away. Cape Town, Johannesburg, Durban and Pretoria obtained large quantities of fresh milk from distant places. That milk could be sent from Twee-spruit to Johannesburg and from Warrenton to Pretoria and arrive at its destination in good condition, was made possible by the fact that the cheese factories for which the milk was originally destined, are able to pasteurize and cool the milk properly. Although these distant sources had to be drawn upon, the fresh-milk requirements of the country were met on the whole.

Eggs.

As mentioned in the previous report, the export trade in eggs during 1942 came to a complete standstill. In order to stabilize prices and assure a reasonable price to producers, the Food Controller instituted a scheme for the purchase, at fixed prices, of any surplus eggs which producers and producers' organizations were unable to dispose of through the ordinary channels. Such eggs had to be graded and packed in standard export boxes. For large eggs (24 oz. per dozen) the price fixed was 1s. 5d. per dozen, and for eggs of medium size (21 oz. per dozen) 1s. 3d. per dozen. In addition, an allowance of 5s. per box of 30 dozen was paid for packing costs.

Initially, participation in this scheme was rendered difficult by a shortage of packing material, but the difficulty was eliminated by the action of the Food Control Organization in making available flats, fillers and egg boxes. Up to 15 December 1942, that is, more or less the end of the laying season, the following quantities of eggs were purchased under the scheme.

If it is borne in mind that the total quantity of eggs which became available for cold storage, amounted to 122,000 boxes up to 31 December 1942 it is evident that the purchases under the scheme were not large. Nevertheless, the influence of the under-

Place.	Number of Eggs.	No. of boxes of eggs (30 dozen each).
Cape Town	1,011,600	2,810
Port Elizabeth	207,000	575
Durban	240,120	667
Bloemfontein	178,200	495
Johannesburg	203,400	565
Pretoria	10,080	28
TOTAL	1,850,400	5,140

taking should not be underestimated. The aim was to ensure that the producer did not receive less than a fixed price for his product, and that aim was undoubtedly realized since, by furnishing the producer with an alternative market for his eggs, his position was considerably strengthened. The following factors were mainly responsible for the small quantity offered to the Food Controller:—

(*a*) large quantities of eggs could be disposed of for ships' stores;

(*b*) military camps absorbed large quantities;

(*c*) the consumption of eggs was far greater than in previous years because the purchasing power of civilians increased and because eggs were used to an increasing extent in the place of imported foodstuffs, e.g., tinned meat;

(*d*) in consequence of the high prices paid for eggs in the preceding season of scarcity, poultry-farmers withheld large quantities of eggs from the market for hatching purposes.

Since the Food Controller purchased only 1,850,000 eggs, no difficulty was experienced in disposing of them. The total quantity was supplied to military camps in the Union at cost price.

As has been stated above, there were approximately 122,000 cases of *eggs in cold storage* in the Union on 1 January 1943. These are more or less the normal stocks at the commencement of the scarce season of the year. In order to protect consumers against excessive prices during the scarce season, the Price Controller, in collaboration with the Food Controller, decided to fix maximum prices for cold-storage eggs. The wholesale price for the best grade cold-storage eggs was fixed at 1s. 8d. per dozen, and the corresponding retail price at 1s. 11d. per dozen. At a later stage it was increased by 1d. per dozen.

In order to conserve supplies during the scarce season, cold-storage stocks were frozen by the Food Controller, and issues to the trade could be made only under permit. Under the permit system dealers could sell cold-storage eggs at their discretion to any interested person. Since it was more remunerative for them to sell large supplies to bakers, ships' chandlers, hotel-keepers, etc., than to individual consumers, private consumers had great difficulty in obtaining cold-storage eggs for domestic purposes.

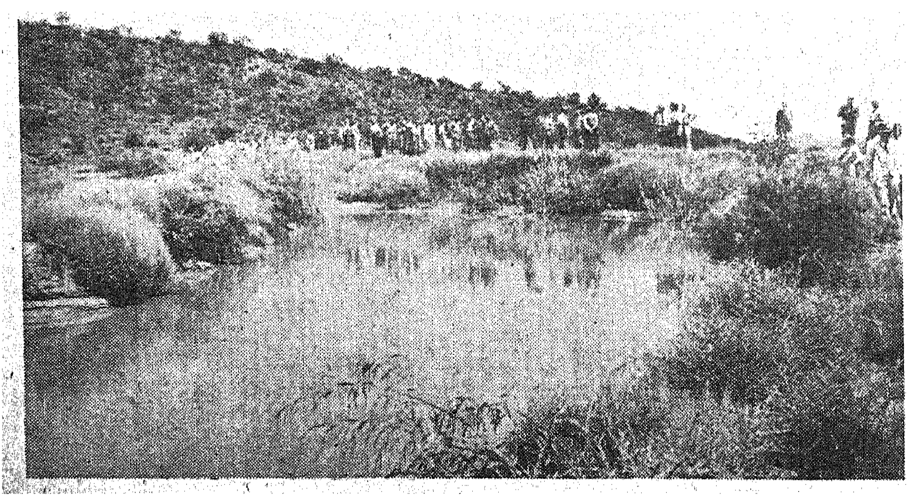
New-laid eggs were scarce during the winter months, and, consequently, exceptionally high prices were asked for them. It soon became clear that the price of new-laid eggs would also have to be controlled, and on 16 July 1943 the Food Controller instituted an *egg-control scheme*. In broad outline it amounts to the following:—

From the above-mentioned date all eggs sold in certain urban areas or so-called "controlled" areas, must be graded according

to definite specifications. The Price Controller has fixed maximum wholesale and retail prices for each grade, which will remain valid for the present season of plentiful production. As soon as the season of normal scarcity commences, the maximum prices will again be raised to compensate for the higher production costs of eggs. The maximum prices of eggs were considerably higher than those of the previous season, the wholesale price for the best grade eggs having been fixed at 1s. 11d. per dozen, and the retail price at 2s. 2d. per dozen.

While the consumer was in this way protected against abnormally high prices, the producer was at the same time protected against low prices. In order to maintain this position, the Food Controller again instituted an egg-purchasing scheme for the purchase of unlimited quantities of eggs from producers, producers' organizations and dealers at the fixed maximum wholesale prices. All stocks which are not absorbed at the above-mentioned prices are therefore purchased by the Food Controller. The sole proviso is that the eggs must be graded according to the grading regulations and packed in standard export boxes. As in the case of the previous egg-purchasing scheme, packing material is supplied by the Food Control Organization, if packers are unable to obtain supplies elsewhere. Owing to the increase in the price of packing material, the allowance made for packing was increased from 5s. to 6s. per box.

One of the most important aspects of the egg-control scheme is the vesting in the Food Controller of the sole right to store eggs in cold storage. The object of this measure is to ensure the placing in cold storage of the maximum quantity of eggs and the proportionate and equitable distribution of supplies among all interested parties during the coming season of scarcity. As a further measure to conserve stocks it was also laid down that no eggs could be sent out of the country as ships' stores or otherwise except with the approval of the Food Controller. In view of the present shortage of meat and other kinds of preserved foods, the importance of eggs as a national food has increased considerably, and the conservation of supplies is vitally necessary.



Donga at Vlekpoort partially reclaimed.

III. The Other Agricultural Products.

THE other agricultural products, raw materials and non-essential food products are, of course, also of great importance, and it is necessary to mention the principal facts in regard to them.

Wool.

During the 1942-43 season approximately 246 million lb. of wool, including that of Basutoland and South West Africa, were appraised at Union ports by the British Wool Commission, in comparison with 250 million lb. last season. On the whole, the wool was lighter and the scoured yield higher this season than last season.

The decrease in the clip must in the first place be ascribed largely to the severe drought which prevailed during the season, especially in the southern and central Karroo, but also in the north-western districts and southern coastal areas of the Cape Province. On the whole, sheep-farming in the northern Karroo was also adversely affected by the drought. In the second place, owing to various factors in parts of the Union where mixed farming can be practised, more sheep were sold on the meat market than is justified by the normal increase in the sheep population, and the wool clip suffered in consequence. The high prices for mutton, as well as for beef and other agricultural products, led to the decision on the part of some farmers who kept Merino sheep under difficult conditions to sell their woolled sheep and to keep more cattle, or to concentrate more on crop-production.

During the year wool-growers enjoyed the benefits of the increased wool prices which came into operation in July 1942 as a result of the new price schedule adopted in agreement with the British Government.

The wool clip of the Union itself for the 1943-44 wool season is estimated at 235 million lb. and that of the Union, Bechuanaland and South West Africa at 250 million lb.

Mohair.

During the 1942-43 season 9,886 bales of mohair were received at the ports, as compared with 10,479 bales last season, and of these 8,805 were sold.

The unsold stocks on hand at the end of the season totalled 2,267 bales in comparison with 1,186 bales at the end of the previous season.

The average weight per bale was 498 lb. as against 510 lb. last season, and the average export value 15·1d. per lb. in comparison with 15·2d. per lb. last season.

Hides and Skins.

The demand for hides and skins remained firm throughout the year. The average prices for the main types of hides and skins, except those of "Capes" (gloving) and goat skins for the 1942-43 season exceeded those of the previous season. The average price, for example, of first-grade dry-salted hides was 7·3d. per lb. for the 1941-42 season, as against 8·2d. per lb. for 1942-43; first-grade sun-dried hides 7·2d. as against 7·8d. per lb., merino-sheep skins (combings) 8·6d. as against 9·5d. per lb., while "Capes." (gloving) dropped from 4s. to 3s. 5d. per piece, and goat skins from 14·64d. to 12·68d. per lb.

In comparison with 1941-42, the export of the most important types of hides and skins decreased on the whole, particularly in the case of woolled-sheep skins and dry-salted hides. The decrease in the export of dry-salted hides may be ascribed to the restrictions on the export of most types of dry-salted hides which are required for local tanneries, and to the amendments introduced in respect of the regulations on curing. The reason for the decrease in the export of woolled-sheep skins must be sought, on the one hand, in the limited American demand for shearlings and, on the other, in the accumulation of supplies of these types in the Union.

The inspection service at the ports was maintained and, in addition to carrying out the inspection of shipments, the inspectors also give assistance in connection with the regulations governing the control of leather.

The regulations in connection with the curing of hides, as promulgated by the Controller of Leather, were strictly applied with very good results. Tanners expressed satisfaction with the new method of curing and reported a substantial increase in the output.

The Hides and Skins Advisory Board once again assisted in various directions in promoting the interests of the industry. The Board devoted itself mainly to the furnishing of assistance to the Controller of Leather in regard to the effective control and distribution of hides, and to the obtaining of reasonable prices for all sections of the trade.

Tobacco.

During 1942 the gross receipts for all classes of tobacco by co-operative societies amounted to 24,540,000 lb. as against 22,894,000 lb. in 1941, and the quantity manufactured 29,999,000 lb. as against 28,791,000 lb. Once again, therefore, the local production was too small to satisfy the demand. This even applies to dark air-cured tobacco, the supply of which for many years exceeded the demand. Unfavourable climatic conditions were mainly responsible for this.

In fixing the annual Southern Rhodesian duty-free import quota, the Tobacco Control Board was therefore also compelled to make provision for a supplementary quantity of tobacco to replace the Union's dark pipe tobacco. Consequently, in addition to the quota of 1,000,000 lb. of Southern Rhodesian Virginia tobacco, for which the Tobacco Control Board made provision during 1942-43, it also allocated a quota of 1 million lb. for inferior flue-cured Southern Rhodesian tobacco to supplement the shortage of pipe tobacco.

During 1942 a total of 4,035,456 lb. of flue-cured tobacco (3,208,634 lb. from Southern Rhodesia) and 352,906 lb. of air-cured tobacco (344,845 lb. from Swaziland) was imported in order to supplement the local production.

The minimum selling prices of Virginia tobacco for the 1942-43 crop year, i.e., the crop marketed from 1 April 1943 were fixed as follows by the Tobacco Control Board:—

Flue-cured tobacco: basic price plus 20 per cent.

Light air-cured tobacco: basic price plus 22½ per cent.

Dark air-cured tobacco: basic price plus 15 per cent. plus ½d. per lb.

The good tobacco prices of last year were therefore maintained, and in certain cases additional small increases were granted, chief of which was an additional ½d. per lb. on dark air-cured tobacco. In view of the limited demand, no prices have been fixed for Turkish tobacco.

Chicory.

The chicory industry is continuing to progress under the guidance and control of the Chicory Control Board. Up to 26 September 1943 a total of 5,235,490 lb. chicory was received by the Chicory Control Board, of which 4,795,671 lb. were first grade. Of the total quantity, 5,090,547 lb. were sold for approximately £84,000.

An advance payment of 60 per cent. was made to producers, and the prices were 32s., 30s. and 27s. per 100 lb. for first, second and third grade respectively. Although the pool has not yet been closed, it is estimated that, as was the case last year, it will again be possible to make an arrear payment of 40 per cent. of the basic price to producers.

Since the demand for chicory continues to exceed the production, the policy of rationing to manufacturers was continued, and rations were railed weekly, with the result that a uniform flow of supplies was effected from the stores of the Control Board to the manufacturers. Although manufacturers found the rations inadequate in view of the rapid increase in the demand for chicory during the past year, they were nevertheless enabled to proceed with their business in a comparatively satisfactory manner.

Citrus Fruit.

The shortage of shipping space for citrus fruits which was a feature of the 1941 season, continued in 1942. Consequently, under War Measure No. 30 of 1942 the Citrus Control Board was once again given full control over the export, as well as the sale on the local market, of all citrus fruits of exporters. The equal pool which was in operation in 1941, was again conducted in 1942.

The Citrus Control Board went a step further, however, in regard to the local marketing of citrus fruit. Whereas in 1941 it sold through the ordinary market agents on practically all markets, it commenced selling through market masters early in 1942, and appointed its own representatives on the four largest markets. As will be realized, this innovation brought considerable advantages both to consumers and producers.

During 1942 citrus fruit was included under the State-aided fruit scheme administered by the Department of Social Welfare, under which the abovementioned Department, in collaboration with the control boards concerned, make fruit available at very low prices to charitable institutions, schools, hospitals, etc. Approximately 108,000 pockets of oranges were disposed of under the scheme, mainly to schools. In so far as oranges are concerned, the scheme was considerably expanded in September 1943. Not only was the price reduced to 1s. per pocket, but larger numbers of the lower-income groups were included, and in the case of school children oranges are even supplied gratis on school grounds. This naturally led to a greatly increased market, and up to the end of November 1943 approximately 300,000 pockets had been absorbed under the scheme.

During the first half of the 1942 season oranges were exported, as in 1941, to the United Kingdom "on consignment" at 22s. 9d. per box with a count of 126 and less, and 23s. 6d. per box with a count of 150 and higher. (The export of other citrus fruit to the United Kingdom has been prohibited since 1941.) Since 10 August 1942 the prices have, in accordance with a new agreement entered into with the British Ministry of Food, been fixed at 21s. 4d. per box with a count of 126 or less, and 22s. 4d. per box with a count

of 150 and higher. For citrus fruit sold locally the Board realized an average market price of 2s. 2½d. per pocket, as compared with 1s. 10½d. during 1941.

Pool disbursements amounted to 1s.9½d. per pocket (4s. 2d. per box) for fruit of export quality, and 5d. per pocket for other. The amounts were calculated on the total estimated crop, and represent the net price at the tree (i.e. after the deduction of all costs in connection with marketing, including the costs of packing material, packing and transport to the packhouses). The corresponding amounts for the 1941 season were 1s. 6d. per pocket (3s. 6d. per box) for export quality and 4½d. per pocket for other.

At the beginning of the 1943 season the Citrus Board was also given a certain amount of control, under War Measure No. 34 of 1943, over the citrus of non-exporters. In addition, the Board went a step further in connection with local marketing, by opening its own wholesale depots in most of the larger cities. At the same time wholesale and retail prices for citrus fruit were fixed by the Price Controller in most of the larger cities and towns of the Union. The wholesale prices were fixed at 2s. 6d. per pocket for first, 2s. 3d. for second, and 2s. for third grade, and the retailer was prohibited from adding more than 9d. per pocket in his price to the consumer. It was also laid down that when citrus fruit is sold loose to consumers in the retail trade, the price might not exceed 1½d. per lb., or 1s. for 12 large or 18 medium-sized or 24 small fruits.

The export of oranges during the present season is on a considerably lower level than during 1942. Up to 1 November 1943 a total of 2,800,000 pockets (1,200,000 boxes) was exported. Local sales of citrus fruit, however, increased considerably, and already amount to almost 6,200,000 pockets, i.e. 100,000 pockets more than the total for the previous season.

For the 1943-44 season the Government again guaranteed a Land Bank loan (£1,374,000) to the Citrus Control Board for the purchase of packing materials, sprays, fertilizer, etc., which the Board in turn made available to citrus producers by way of loans. Practically the whole amount of the previous year's loan has already been repaid.

Deciduous Fruit.

As was the case during the previous two seasons, it was again impossible during the 1942-43 season to export fresh deciduous fruit to Great Britain. Consequently, the whole export crop had once again to be marketed locally. The scheme which was instituted in 1940-41 under the administration of the Deciduous Fruit Board to keep the deciduous fruit export industry going under the exceptional circumstances, and which was continued with modifications in 1941-42, was therefore again put into operation, subject to a few further minor amendments in the 1942-43 season (War Measure No. 52 of 1941, as amended by War Measures Nos. 23 and 137 of 1942).

Producers in the export districts of the Cape Province were again required to deliver all plums and pears to the Deciduous Fruit Board at fixed prices. Exporters of grapes, peaches and apples could, if they so desired, deliver only the export portion of their fruit to the Board at fixed prices. The prices at which the Board purchased the fruit from producers, although lower on the average than the pre-war export prices, are calculated to maintain the industry, and were fixed for all kinds of fruit on a slightly higher level than that which applied in respect of the previous season.

The Board markets as much as possible of the fruit in the fresh form, and the remainder is converted into wine, dried or sold to

canning factories. Since the total deciduous fruit crop considerably exceeds the local consumption, it is essential that a far larger percentage of the fruit should be dried or otherwise preserved than was the case under normal conditions. In order therefore to effect the necessary expansion of wineries and drying yards, various loans were granted to the Board during the past three years. At present the Board is now devoting particular attention to the development and establishment of dehydration facilities designed to save time and labour and also to produce a better quality dried product. These facilities are expected to be of permanent importance to the deciduous fruit industry.

With a view to enabling the Deciduous Fruit Board to make loans available for production and packing materials to producers who previously were dependent on the export trade for credit facilities, the following loans were granted to the Board by the Land Bank in 1942-43, with a Government guarantee.

Production loan: £150,000.
Packing material loan: £191,000.

So far repayment of the loans has proceeded very smoothly, and there have been practically no cases of default.

In addition, a Land Bank loan of £500,000 was made available to the Deciduous Fruit Board under Government guarantee in order to enable it to make the above payments to producers at the fixed prices for fruit delivered to the Board, and to finance marketing and other pool expenditure. In consequence of the relatively low selling prices for both dried and fresh fruits and the higher costs of packing material, an appreciable deficit occurred on the 1942-43 deciduous fruit pool. This deficit will amount to approximately £350,000. Owing to the larger production of plums and peaches in comparison with that of the previous season, the marketing prices of these varieties of fruit were on the whole lower. Grapes and apples realized more or less the same prices on the market, while pears, in consequence of a short crop caused by severe codling-moth infestation, fetched slightly higher prices than during the previous season.

During 1942-43 the quantity of fresh fruit marketed locally by the Deciduous Fruit Board was approximately 1,250 tons more than the quantity marketed during 1941-42. The increase was most striking in the case of plums, peaches and grapes. The State-aided Scheme which was instituted in 1941-42 by the Department of Social Welfare in co-operation with the Deciduous Fruit Board, whereby certain kinds of deciduous fruit were made available at lower prices to the same classes of institutions as those mentioned in the case of citrus fruit, was continued in 1942-43, although less fruit was absorbed under this scheme than during the previous year. The canning factories also took in less fruit.

From experience gained during the past three seasons it appears that the scheme which has been in operation up to the present, has certain shortcomings. The Committee of Inquiry which was appointed this year to inquire into certain aspects of the scheme, emphasized the following points in particular:—

(*a*) Since the Board had control over only a portion of the deciduous fruit crop it could not properly regulate supplies to the various markets and, consequently, competition virtually resulted between the Board and producers on certain markets.

(*b*) In view of the fact that no definite line of demarcation exists between exporters and non-exporters, the distinction drawn in the scheme is largely artificial.

In order to surmount these difficulties, the scheme approved of for the 1943-44 season departs considerably from that of previous seasons. Full control over grapes and peaches, and also over pears and plums, was conferred on the Board. The earlier distinction between exporters and non-exporters was also modified considerably. Furthermore, a fixed sum of £280,000 will be placed at the disposal of the Board to cover pool deficits.

Loans for production and packing material, as well as a loan to enable the Board to make advances on fruit delivered to it and to defray marketing and other expenses, were, however, also approved for the coming season, as was done in previous years. These loans are all repayable.

Dried Fruit.

As was the case during the previous two seasons, the Dried Fruit Board was again appointed under the Emergency Regulations as the sole buyer of raisins, unbleached sultanas and currants for the 1942-43 season (War Measure No. 8 of 1942). Other dried vine fruits may be purchased only with the permission of the Board. At the beginning of the season the Dried Fruit Board was also appointed as the sole buyer of dried apricots (War Measure No. 126 of 1942). A number of agents were appointed under contract to take in the raisins, sultanas, currants and apricots for the Board at fixed prices, and to process and pack the surplus on its behalf.

The production of dried vine fruits was 13,370 tons as compared with 13,700 tons during the previous year. In spite of the increase in local consumption, a considerable surplus was available for export, and this has again been sold under contract to the British Government and exported at fixed prices which were slightly higher than those of last year.

The production of other dried fruit (i.e., other than vine fruits) amounted to 4,260 tons in comparison with 4,660 tons last year. There was a considerable increase in the production of dried peaches and apricots. The increase was offset, however, by a decrease of more than 2,000 tons in the production of prunes and a small decrease in the production of dried pears.

The Board's intake prices during the past season for raisins and sultanas were calculated to assure to producers an average price of 3d. per lb. in comparison with 2·65d. per lb. last year. (As a result of the exceptionally high quality of the crop last year, the average price was actually 2·85d. instead of the estimated 2·65d. per lb.) Any deficit on these intake prices will be borne jointly by the Government and the K.W.V. In the event of there being any pool surplus, it will be paid out in the form of an arrear payment to producers.

The intake prices of dried apricots were calculated to assure to producers approximately 12s. 6d. per 100 lb. fresh fruit (drying allowance excluded). There was, however, a considerable surplus in respect of the dried apricot pool, and it is expected that an arrear payment of approximately 2s. 6d. per 100 lb. (fresh) will be paid to producers.

The Price Controller has also fixed maximum wholesale and retail prices for the classes of dried fruit taken in the by Dried Fruit Board.

For the coming season more or less the same scheme as that of last year has been approved. In the case of apricots full control

has been granted in respect of fresh apricots supplied to canning factories, as well as in respect of the dried product supplied to the Dried Fruit Board, in order to ensure that both classes receive equal treatment.

Viticultural Products.

Once again viticultural production showed an increase and totalled 435,736 leaguers in 1942, as against 396,711 in 1941, and 326,053 in 1940.

In the past this expansion of production took place largely at the expense of quality. On the whole, too much attention was given to quantity. Now that the K.W.V. has control over good wine, it is hoped that in future more emphasis will be laid on quality, not only in respect of distilling wine, good wine and quality wine, but also in respect of the different grades of distilling wine as such. Such a policy will undoubtedly be in the interests of the industry as a whole and, consequently, must ultimately also benefit the individual wine-farmer. Indeed, the necessity for quality improvement in regard to all our agricultural products has already been abundantly proved in the past. It is hoped that all those interested will co-operate in this connection. This matter is all the more important in view of the post-war disposal of viticultural products. Oversea marketing possibilities are much more limited at present, but the intention is, when conditions have become normal again, to make special efforts to derive the maximum benefits from the oversea market, and this is possible only if our viticultural products can compete with those of other countries on a quality basis.

Although shipping difficulties and the restriction in certain countries on the importation of alcoholic liquors had a hampering effect on their disposal, wine farmers were compensated to a large extent by an appreciable increase in the consumption on the local market, particularly in so far as brandy was concerned. The increase purchasing power of the public, the presence of large numbers of foreigners and the absence of imported liquor, especially whisky, are the main factors responsible for the large increase in the local consumption.

Timely arrangements were made to provide for the increased local needs. On 31 December 1942 the total net supply of the 1939 rebate brandy on hand in the Union amounted to 300,000 gallons, and that of mixed brandy to 151,206 gallons, while the rebate brandy distilled during 1940 and available for consumption in 1943 amounted to 475,000 gallons. The total quantity of rebate brandy available for 1943 is therefore approximately 775,000 gallons, which is sufficient for the manufacture of approximately 3,000,000 gallons of mixed brandy on the basis of 25 per cent. rebate brandy and 75 per cent. spirits. This quantity ought to be adequate since it is estimated that the consumption of mixed brandy in 1942 amounted to roughly 2,000,000 gallons. In order to assure the supply position of brandy, quotas of rebate brandy were also allocated to dealers by the K.W.V. on a uniform basis, and no brandy containing rebate brandy will be exported.

As in the case of other agricultural industries, the production costs of the viticulturist also increased, mainly in so far as labour was concerned. Farmers were, however, compensated for the increased costs by the higher prices which they received during the past few years. The K.W.V. raised the price of distilling wine from £7. 18s. 9d. per leaguer in 1941 to £9. 10s. 6d. per leaguer

for the 1943 crop, while the price of good wine was increased from £6 and that of quality wine from £10 per leaguer in 1941 to £7 and £11 per leaguer respectively, for the 1943 crop.

Wattle Bark and Extract.

During the calendar year, 1942, a substantial increase took place in the value of exports in the wattle industry. This is entirely due to the increase in the quantity and value of wattle extract, since both the quantity and value of bark showed a slight decrease as compared with 1941. A gratifying feature of the recent expansion of oversea markets for South African wattle bark and extract is the sale of these products in the United States of America. The quantity of wattle bark and extract taken by America from the Union in 1942 was 25 times greater than in 1940. The attention devoted by the Department in recent years to the development of this market and the information furnished to tanners in America in regard to wattle-tanned products contributed in no small measure to the increase in sales. Every effort must be made by the wattle industry to retain the American market after the war.

Once again attention must be drawn to the fact that the consumption of wattle bark exceeds the quantity which the industry is able to supply on a sustained basis. Retrogression is also discernible in regard to the technique of the re-establishment and control of trees. Unless these defects are eliminated, a falling off in both the quantity and the quality of wattle products is inevitable, and this will, of course, have an unfavourable effect on the export trade. There is no doubt that competition on the world market for wattle-tanned products will become keener, and the local industry will have to make timely efforts to improve the quality of the bark and to reduce production costs.

Research work in connection with the various aspects of the wattle industry was well maintained during the year.

Timber.

The State plantations are becoming increasingly important as the war continues and as the country's dependence on South African timber increases, not only for our total requirements, but also for the increasing variety of needs which our own timber must meet.

The total quantity of timber sold amounted to 22,285,356 cubic feet, of which the indigenous forests contributed 572,706 cubic feet. More than 14½ million cubic feet of the timber derived from plantations consisted of softwood. Of this roughly 9½ million cubic feet were supplied to private saw-mills and about 5 million cubic feet to the State saw-mills. The demand for poles of all kinds, both treated and untreated, was very great, and the production of this kind of timber increased considerably. The above figures clearly indicate that the State plantations are already fulfilling a very important function in the economic life of the country.

Notwithstanding the enormous increase in production during the past few years, by far the greater part of the supplies is still drawn from normal thinnings and reserves built up before the present period of intensive utilization. Inroads into the capital supplies of our State plantations are, however, inevitable. This will, of course, have unavoidable repurcussions on the future of the Union's saw-mill industry, and all possible steps are already being taken to obviate any dislocation of the industry during the post-war period.

IV. The Normal Activities of the Department.

OWING to the paper shortage, the Department deeply regrets that the present report, like that of the previous year, cannot furnish a complete review of all its activities, or even of its most important activities, and that a wide field must necessarily be left untouched. Consequently, it has been necessary to confine the report to subjects which are of cardinal importance under the prevailing conditions, i.e., to Food Control and certain economic matters which are at present prominently in the foreground and not only dominate our national life, but also constitute the centre of the natnion's interest.

This does not by any means imply, however, that the normal activities of the Department have been relegated to the background. The abnormal circumstances inevitably necessitated restrictions in certain respects but, on the whole, the Department vigorously applied itself to the prosecution of its fundamental activities which cover a very wide field, and strained every nerve to promote the interests of agriculture and the farming community.

The Utilization, Conservation and Restoration of our Agricultural Resources.

The whole question of the utilization, conservation and restoration of our soil—the basis of the entire agricultural industry—came into great prominence during the past year and received the constant attention of the Department, as well as of the public. The latter feature is particularly gratifying, since it would appear that both our rural and urban populations are being forcibly awakened to the fact that, unless all concerned actively apply themeslevs to the care, maintenance and proper utilization of our soil and other resources, there is no future for agriculture and, consequently, not for our other economic activities either since, in the final analysis, the latter are also dependent upon the soil.

On 3 August 1943 I delivered a lecture to " The Associated Scientific and Technical Societies of South Africa " in Johannesburg, and dealt with the fundamental aspects of this problem, as well as with its broader implications, with a view to the activities of the future. I also availed myself of the opportunity to point out briefly the achievements in this field during the past decade. That such a subject was chosen for discussion by a purely urban association is clear evidence of the fact that there is a feeling of uneasiness throughout the country and that the nation is realizing that we simply *must* preserve our soil if we are to survive.

Furthermore, a rapidly increasing interest is being displayed by the farming community in the reclamation and conservation of our agricultural resources, and we may, therefore, confidently expect that the application of research results to individual farming systems, will henceforth make faster progress. The research work itself is being vigorously continued in order to extend the fundamental data required in connection with this work, and so ensure the improvement and stabilization of farming.

Many people forget that the question of soil-erosion control and cognate problems have been receiving serious attention for a number of years, but there can be no doubt that the wide interest now being displayed is largely due to the work done during the past few years in connection with erosion control, pasture research, weed eradica-

tion, etc. A few figures in regard to the money spent on some of the measures taken would not be out of place here.

Up to 31 December 1942 a sum of over £2,000,000 was spent directly under the various soil erosion schemes, i.e., in respect of bonuses paid out, advances granted, wages under scheme C, etc. To this must be added the indirect expenditure of about £250,000 paid out in respect of the salaries and travelling expenses of soil-erosion engineers and local committees. This amount does not include the expenses incurred in connection with the administrative and clerical staff, which naturally also run into an appreciable sum. Viewed from the farmer's side, it must be stated that up to the present a sum of approximately £1,800,000 has been paid out in bonuses, subsidies and wages. It will be realized, however, that the actual benefits conferred on the Union's agricultural industry by the soil-erosion schemes cannot be assessed in terms of money. The benefits are mainly reflected in improved farms, the promotion of better veld management, and increased land values in general. In so far as weed eradication is concerned, a sum of £172,000 was spent on a pest like jointed cactus alone, before the biological method of control was adopted. During the past seven or eight years marked progress has also been made in the field of pasture research. No less than £300,000 was spent on this work, while the Department has at present sixteen experiment stations which devote themselves exclusively to this work.

As regards the past year, it may be stated that notwithstanding the present exceptional circumstances, the normal activities of the Department in connection with the reclamation, conservation and rational utilization of the soil, veld and water facilities of the country were successfully continued, and that good progress was made.

Soil Erosion.

Steady progress is still being made with the reclamation of soil ravaged by erosion, and the facilities made available by the Department under the anti-erosion scheme are utilized on a considerable scale for this purpose.

One of the most important results of the Department's efforts is reflected in the fact that, on the whole, those concerned are gaining a better conception of the broader scope of the erosion problem. Initially, the construction of dams, usually intended for stock-watering purposes, was the main aim of farmers who availed themselves of the erosion-control scheme. Of course, this was and continues to be useful work but, as will be readily understood, it did not strike at the root of the problem. In course of time greater interest was aroused in the actual reclamation of eroded land. This was a great forward step, and people are also becoming increasingly aware of another important fact, viz., that pasture improvement and control, and the prevention of soil erosion, form a single problem.

The application of suitable methods of veld utilization will maintain the veld in good condition, ensure more feed for stock, and check surface erosion. The soil, the veld, the stock and the income of the farmer will all benefit. These fundamental ideas are beginning to find more acceptance with our farmers and there are encouraging signs that good progress may be expected in this respect in the near future.

It took some considerable time to convince grain farmers that it is essential to protect their cultivated lands against erosion, especially those situated against slopes. Gradually, however, interest in contour farming increased, and this system has now become a fixed practice in several districts. Hence, in this connection too, farmers are

gradually viewing the matter in the right perspective, with the result that correct methods have already been introduced on several farms, e.g., the application of rotational cropping between the contour banks and the introduction into the rotational system of a perennial grass for the restoration of the good structure of the soil. In this way it will be possible to maintain the fertility of the soil and to strengthen its ability to resist erosion. Those farmers who have adopted these improved methods for the maintenance of the productivity of the soil and the prevention and control of erosion, are highly satisfied with the results so far obtained, and this should serve as an incentive to other farmers.

Particulars in regard to the reclamation scheme applied in the *Vlekpoort Conservation Area* were given in the previous annual report, and it is, therefore, unnecessary to repeat the particulars here. It may be mentioned, however, that good headway was made during the past year with the programme of activities. Reclamation work on the severely-eroded farms purchased by the Government is in full swing, and the progress made with works undertaken on private farms by the owners themselves is very encouraging. In addition to the works carried out by this Department in the area concerned, the Department of Irrigation is also assisting with the construction of larger retaining dams in the Vlekpoort River and its tributaries. Two such dams have already been completed.

Good progress is being made in connection with the *Drakensberg Reclamation Scheme*. In this connection it is of interest to mention that it is the intention in the near future to proclaim a large portion falling under the scheme—almost 500,000 morgen—as a conservation area in pursuance of the Forest and Veld Conservation Act of 1941. This means that the same intensive conservation and reclamation measures as are at present being carried out in the Vlekpoort area are envisaged for this area.

Silo and Grain-silo Scheme.

Once again extensive use was made of the silo scheme, and many farmers have already been enabled to build silos with the State assistance granted under this scheme. As will be readily realized, the scheme is of immense value to stock farmers and it makes an important contribution to the improvement of the nutrition of our cattle.

During the year a supplementary scheme was instituted, viz., the grain-silo scheme under which a bonus is paid on silos intended for the storage of grain on farms. The object of the scheme is to encourage the saving of bags and to reduce the wastage of grain. The Department supplies proper plans and specifications for the building of such silos.

Pasture Research.

Increased costs and the scarcity of material greatly hampered the work being done at the sixteen pasture research stations of the Department. The shortage of fencing material also hampered the expansion of co-operative experiments on farms. Obviously this aspect of pasture-research work is of great importance, since it is essential that the results achieved at the experiment stations should be tested out further under normal farming conditions and brought to the more immediate notice of farmers.

Despite the difficult circumstances, a large amount of useful work was carried out on the experiment stations and farms. More information was gained on a large diversity of subjects, and the Department was thereby enabled to give more definite guidance. So, for example, more light was shed on the contentious veld-burning problem. This

is a matter of such great importance that a short summary of the results so far obtained for the summer-rainfall area is desirable.

(*a*) Veld-burning cannot be condemned unreservedly as undesirable in all cases.

(*b*) Sourveld which cannot be mown must be burnt every second or third season in order to remove accumulated old grass.

(*c*) Should there be an accumulation of old grass on mixed and sweet veld which cannot be mown, the veld must be burnt every now and again, but less frequently than in the case of sourveld.

(*d*) An accumulation of old grass invariably causes selective grazing, which leads to a decrease in the superior grasses. Where sweet veld is threatened with a dangerous increase in thorn-trees, a desirable practice is to leave sufficient old grass to make veld-burning possible every third, fourth or even fifth year, in order to keep the young thorn-trees in check.

(*e*) Where burning is essential, it must on no account be carried out in autumn or winter. This is the general practice, but it is extremely injurious to the veld. The burning must take place after the first good early summer rain, when the soil is thoroughly moist and the grass can start growing immediately.

(*f*) It is most important that stock should not be put on burned veld when the first signs of green growth appear, as is so often done with sheep. This practice is very harmful to the veld. A fairly advanced stage of growth is necessary before the veld is suitable for grazing.

(*g*) Where a mowing-machine is used, it is more advisable to convert superfluous summer grass into useful hay, rather than to allow it to mature. This applies particularly to sourveld, which is practically valueless when mature.

(*h*) Grass which cannot be converted into hay in good time, may be cut towards the end of July and in August, and instead of being burnt, may be utilized for making compost.

(*i*) Apart from the valuable hay and compost which it provides, such mown veld also furnishes green grazing earlier in spring and produces a very much higher yield during the growing season than similar veld which has been prematurely burnt.

(*j*) Briefly, the crux of the matter is that injudicious and untimely veld-burning may have a very adverse effect on the veld; that surplus summer grass from which valuable hay or, at any rate, compost can be made, is still generally burned without regard to the consequences; but that veld-burning as such cannot be unreservedly condemned and completely eliminated, because in certain circumstances burning is beneficial to the veld, provided it is carried out according to definite directions.

Further information was also collected in regard to other veld and pasture problems. On the pasture-research stations and also on farms where farmers co-operate, very good results are being obtained with the application of pasture systems, which have been developed for various types of veld and in which the utilization of veld hay and cultivated grasses have been included. These methods should, however, be put into practice by many more farmers. By correctly utilizing the veld, artificial pastures and other feeds produced on the farm, we will render a great service to the soil as well as to the livestock industry.

Eradication of Weeds.

Although war conditions, as for example, the absence of a considerable number of farmers on active service, the scarcity of farm

labour, etc., have hampered work in connection with weed control, it can nevertheless be stated that the weed position in general has not deteriorated. In some areas, and along several rivers where heavy infestations of burweed and cockle-burr occurred, satisfactory progress was made with the work of eradication and the position is definitely improving.

Prickly Pear.—The campaign for the biological control of prickly pear was continued during the year. Unfortunately, the cochineal insect which has already been replaced by the cactoblastis and which has in many cases given such encouraging results that there was a time when it was thought that it would bring about the total eradication of the prickly-pear pest, has in some cases now lost a great deal of its effectiveness. In the Orange Free State, Transvaal and Natal very good results are still being obtained with the cochineal insect, and prickly pear is being destroyed on a considerable scale by this parasite. In the eastern Cape Province, however, where the densest and most extensive prickly pear infestations occur and where the cochineal has done good work in the past, the insect has lost much of its vigour. At the same time its natural enemies have increased to such an extent that its numbers are largely kept in check. Consequently, its destructive effect on prickly pear is no longer so pronounced.

It appears that the cochinal now gives the best results when used for killing prickly pear which has been cut down. A large-scale experiment in this connection was, therefore, started at Cookhouse where Italian prisoners of war are being employed for cutting down the plants. Several thousand morgen of prickly pear will be cut down and it is hoped that the cochineal will complete the work of destruction. Farmers on whose farms the operations are carried out, contribute up to a maximum of 5s. per morgen towards the labour costs. The intention is to repeat the experiment at Graaff-Reinet and Uitenhage. The fact must be emphasized that this is not a relief scheme for general application, but an experiment, the results of which have first to be observed before it can be finally decided whether the method is practical and economical.

Jointed Cactus.—In last year's report mention was made of the difficulties experienced in connection with this pest. Unfortunately, the position has as yet shown no improvement. In the past, dense infestations were destroyed by cochineal insects. The decline in the effectiveness of the cochineal insect, the difficulty experienced in securing large quantities for distribution and the occurrence of extensive scattered infestations on which the cochineal insect cannot be effectively used, have brought about a deterioration in the general position. In many cases these scattered infestations occur on farms which had previously been cleared by mechanical methods but on which sufficient joints were left to produce a fresh infestation.

It is the duty of the farmers concerned to give very serious attention to this matter, since the State cannot allow areas which have already been cleared at great cost to be re-infested.

Cockle-burr and Burweed.—Burweed still occurs in all districts of the Union, and practically the same can be said of cockle-burr. Generally speaking, however, farmers pay more attention to these two weeds than to any other weeds proclaimed under the Act. Interest is steadily increasing, and a considerable improvement can be reported. The control of former dense infestations along rivers is proving increasingly successful.

Dodder.—It is essential that farmers should pay more attention to this weed which is increasing not only in lucerne lands, but also in the veld.

Unproclaimed Weeds in the Veld.—The increase in thorn-trees, Rhenoster bush, harpuis, etc., in the veld is definite proof of incorrect methods of veld utilization. As a result of the injudicious utilization of the veld, the superior veld grasses deteriorate and disappear, and their place is taken by inferior grasses, weeds or shrubs. On the whole, our farmers do not appear to realize the truth of this fundamental fact. They often turn to the State to assist them in controlling these inferior plants, but they can themselves do much to improve the position by eliminating incorrect farming practices. The Department is continuing in its efforts to convince our farmers of the necessity for applying the correct farming practices in order to control these useless, uneconomic and, in some cases, even poisonous plants.

Stock Improvement.

It is not possible in the limited scope of this report to dilate at any length on the constructive work of the Department in connection with the other important natural resource, namely, our extensive animal-husbandry industry in all its various ramifications. A few main facts must, however, be emphasized.

In view of the delicate relationship existing between soil, veld and stock, it is essential that the livestock industry should receive the fullest attention, otherwise a disturbance of the entire equilibrium of agriculture will result. Indeed, the prominent position which stock-farming should occupy in our agricultural economy makes it imperative that steps should be taken for the development and care of that industry. Moreover, stock-farming is very closely related to soil utilization and is, therefore, also important from the point of view of soil conservation and the maintenance of the veld.

The Department has, of course, for many years been directing systematic efforts at improving conditions for the stock industry. By way of example, mention can be made of all that has already been done, and is still being done, in connection with the control of stock diseases, and of the vast improvement which has been effected in our woolled-sheep and dairy industries.

The Cattle-improvement Scheme.

What was lacking for years, however, was effective machinery for a comprehensive cattle-improvement scheme. This was established in 1934 with the passing of the Livestock and Meat Industries Act (Act No. 48 of 1934). Actually the matter was tackled from two angles, namely from the feeding side and from the breeding side. In so far as the first is concerned, fodder conservation and veld improvement have become cardinal features of our whole agricultural policy, and not only was the work maintained from year to year, but new directions of development were also followed from time to time. This work is still being vigorously prosecuted and, whatever its value may be to South Africa in other respects, it is definitely indispensable to stock-farming, since feeds, after all, constitute the essential basis of the various branches of farming.

The essence of the cattle-improvement scheme is contained in those provisions of Act No. 48 of 1934, which enable farmers to apply on their own initiative for the proclamation of a ward or district as a cattle-improvement area, after which farmers in such areas are allowed to keep only approved bulls. The principal object of the

whole scheme is, therefore, the improvement of bulls, since an improvement in the standard and productivity of our cattle can be effected only by the gradual elimination of scrub bulls.

From the very outset the scheme was hailed with keen enthusiasm by farmers, and since its inception about 160 areas have been proclaimed cattle improvement areas. Without a doubt the favourable effect of the scheme is already perceptible in many parts of the Union. Nevertheless, the high expectations originally cherished were not all realised, owing to the failure for various reasons on the part of some farmers, and particularly natives, to replace rejected bulls in proclaimed areas. In stands to reason, therefore, that the success of the scheme was greatly hampered in consequence, and the rectification of this remissness continues to be one of the principal responsibilities resting on the owners concerned.

During the past year almost 27,000 bulls were inspected bringing the total number of inspected bulls to 262,624.

An important part of the cattle-improvement scheme is the *bull subsidy scheme.* As has already been announced, it was decided a few years ago that a proclaimed area would not enjoy the benefits of the scheme for a longer period than 7 years, and that in any case the scheme would lapse on 30 June 1945. In pursuance of this policy the scheme has already lapsed in 109 districts.

An amount of approximately £73,000 was paid out during the year in bull subsidies. This works out at £9. 13s. 3d. per bull. Since the introduction of the scheme a sum of approximately £570,000 has been spent under the scheme.

The Horse Industry.

During the year special attention was also given to the horse industry. The Department placed its activities in this connection under the supervision and management of a separate senior officer, in order to encourage development and in an endeavour to alleviate future transport and labour problems. Unfortunately, pure-bred animals can no longer be imported, and the available stud animals must, therefore, be utilized to the best advantage. Nevertheless, a commencement was made with the reorganization of the industry, and a stud has been built up to serve as a nucleus from which other studs will gradually be built up. Naturally, this is a slow process, but encouraging progress is discernible. The breeders' associations concerned are actively assisting in the breeding of pure-bred horses and donkeys, particularly the heavier type of draught-animal. That there has been an appreciable revival in the horse-breeding industry is evidenced by the enormous increase in the demand for horses and the consequent rise in prices.

The Stud Service Scheme, which has already been in operation for some considerable time and under which the Department maintains stallions at certain colleges of agriculture and experiment stations to which farmers can bring their mares, continues to make an important contribution towards the building up of a better horse and mule industry. Farmers are making increasing use of this service which must ultimately result in the production of a larger number of improved horses and mules in this country.

Control of Stock Diseases and Agricultural Pests.

Since the Department is fully alive to the fact that agriculture in the Union is hampered to a very great extent by the presence of a large number of stock diseases and agricultural pests, farmers are constantly assisted in their struggle aganst these natural visitations by

enlightenment and research work. During the past year the Department once again made vigorous efforts to discover remedies and means for their control.

Stock Diseases.

Although the comprehensive veterinary activities of the Department were conducted on a slightly reduced scale during the past year, the work was vigorously pursued both at Onderstepoort and in the field.

The disease which demanded most attention was *East Coast Fever.*

In the previous report mention was made of a number of outbreaks of East Coast Fever in the northern part of Natal. The disease spread in the Vryheid district and also to several farms in the neighbouring districts. In the Vryheid district 66 farms were infected, while the following outbreaks occurred in other districts in Natal: Umzinto, 1; Umvoti, 1; Pietermaritzburg, 1; Pinetown, 1; Ndwedwe, 1; Ixopo, 1; Polela, 4; Helpmekaar, 1; Utrecht, 3; Nqutu, 2; Babanango, 3; Ngotshe, 3; Estcourt, 3; and Weenen, 1; making a grand total of 92 outbreaks. On some farms in the Vryheid district, as well as in other districts, the mortality was exceptionally high. The total mortality in Natal was 2,363 head of cattle.

So rapidly did the disease spread in the *Vryheid district* that dipping and quarantine measures alone were not sufficient to control it, and, consequently, it was decided to slaughter all cattle on infected farms. The Food Control Organization equipped two mobile veld slaughter units which were set up from time to time on centrally situated farms where considerable numbers of cattle were slaughtered under hygienic abattoir conditions. Since the slaughtering was undertaken with a view to assisting farmers, it was carried out on a purely voluntary basis. Cattle were slaughtered only at the request of farmers. The sole proviso was that farmers on infected farms were required to have all their cattle slaughtered so that the slaughtering could also contribute towards the suppression of the disease. Farmers on contact farms, however, were allowed to have as many head of cattle slaughtered as they desired at the slaughtering units on the neighbouring infected farms. In other words, the Department followed the established slaughtering policy which is calculated to promote the suppression of the disease.

The Food Control Organization purchased the meat from the farmers on a fixed grade-weight basis, subject to a deduction of 8s. per 100 lb. slaughtered weight to cover slaughtering and other costs. Subsequently, however, this deduction of 8s. per 100 lb. slaughtered weight was withdrawn with retrospective effect in every case where all the cattle on an infected farm had been slaughtered. This was done in pursuance of an interim recommendation of the *East Coast Fever Commission* which was appointed by the Government in April 1943 to investigate and report on the repeated occurrence of East Coast Fever, with special reference to the recent outbreak in the Vryheid district.

The East Coast Fever Commission consisted of Mr. S. A. Elliot, Chief Magistrate of Johannesburg as Chairman, Dr. P. J. du Toit, Director of Veterinary Services, Senator P. J. Wessels and Mr. W. G. Stanford as members, and Mr. J. Coetzee, Professional Assistant of the Department of Agriculture and Forestry as Secretary. The Commission undertook a comprehensive investigation, in the course of which the following places were visited: Pretoria, Pietermaritzburg, Vryheid, Dundee, Durban, Empangeni, Port Shepstone, East London,

Umtata, Kingwilliamstown, Komgha, Louis Trichardt, Nelspruit and Johannesburg. The Commission's investigation has been completed and its report is being awaited.

In view of the fact that certain persons laboured under a misapprehension in regard to the slaughtering in the Vryheid district which aroused a considerable amount of unnecessary anxiety among farmers in various parts of the country, it must be reiterated here that the Department did not enforce compulsory slaughtering. Cattle were slaughtered only at the voluntary request of farmers. The main object in view was to assist farmers, and it was possible to provide this assistance with the maximum benefit to them since the Food Control Organization was able to purchase the meat. Had this not been the case, the slaughtering on the individual farms would not have been possible.

The Department also made arrangements to supply farmers, whose cattle had been slaughtered, with tractive power for the cultivation of their lands. It is clear, therefore, that in applying the slaughtering policy, the interests of the farmers and the country in general were the primary consideration.

In the Transvaal and eastern Cape Province no outbreaks of East Coast Fever occurred. Three of the severely infected farms in the Peddie district were cleared of cattle by slaughtering.

In the Transkei two outbreaks occurred, one in the Libode district and one in the Engcobo district, both in dipping-tank areas, which had previously been infected. In the case of the Engcobo outbreak only one death occurred, but in the Libode outbreak 74 deaths have already been recorded up to the present.

In so far as other stock diseases are concerned, it must be stated that the *nagana position* has unfortunately deteriorated considerably. As a result of a severe drought in the reserves concerned in Zululand, the limits of the tsetse fly were considerably extended by game, with a consequent increase in the incidence of nagana in certain areas. The position was thoroughly reviewed by the Departments concerned and the Natal Provincial Administration in co-operation with farmers, and it was agreed to adopt a policy of shooting all game except the white rhinoceros in the southern area. The intention is also to clear the southern part and so force the game northwards. The execution of this policy is at present in progress.

In so far as *scab* is concerned, the position has remained the same as last year; there were 19 outbreaks altogether, of which 15 occurred in the Transvaal. The infestations in this province are still mainly due to the large number of sheep which are moved to Swaziland every year for winter grazing. In the Cape Province only 4 outbreaks occurred, while Natal, the Orange Free State and the Transvaal remained free from the pest. The general position is, therefore, very satisfactory.

The general position in regard to *anthrax* remains more or less unchanged. Owing to the scarcity of syringes and needles it was possible to inoculate only the cattle in a part of the Transkei, instead of througout the area, as is usually done. In the other provinces, too, a large number of animals were inoculated under the supervision of officers of the Department. In Natal alone, the number amounted to over 500,000.

At present there are 84 herds participating in the Departmental test scheme for *tuberculosis*. The position is, therefore, unsatisfactory, since the figure clearly shows that there are still far too few farmers who are building up officially-recognised clean herds.

The necessary steps were taken in regard to the following *other proclaimed diseases* which occcurred: rabies, dourine, scab in goats and large stock, epizootic lymphangitis, bacillary white diarrhoea and fowl typhoid. There were no outbreaks of glanders, swine plague or other proclaimed stock diseases.

In so far as *non-proclaimed diseases* are concerned, there are a few points of interest to be noted. Tick-borne diseases have once again caused a high mortality among cattle. So, for example, in Natal, a province in which regular dipping is compulsory, over 3,800 cases of red-water and nearly 3,000 cases of gallsickness occurred. An alarming feature is that this type of disease occurs fairly generally at present in areas like the Transvaal highveld and the Orange Free State where it was previously unknown. Unfortunately there are still many cattle-farmers who do not appreciate the necessity for regular dipping. Horse-sickness and blue-tongue were, on the whole, not very severe. Paratyphoid in calves caused considerable losses and occurred in almost all areas. As regards small stock, there is not the slightest doubt that in the great majority of cases, losses were due to internal parasites.

During the year a poisonous alga was discovered in the Vaal Dam. Considerable stock losses were suffered as a result of its ingestion. Everything possible is being done by the Department concerned, in consultation with this Department, to destroy the poisonous algae in the water of the Vaal Dam by the extensive use of copper sulphate.

The *blowfly pest* continues to receive the serious attention of the Department, both in the field of research and in the development of further methods of control. In order to assist farmers as far as possible, it has now been decided to sell the spray to dealers who apply for it. This step will enable farmers to obtain the remedy more easily.

Insect Pests and Plant Diseases.

The important work undertaken in connection with the control of plant diseases and insects was successfully continued despite the difficult problems created by the war, especially in regard to the procuring of materials and equipment for control. Many insecticides are unobtainable at present, and it has already been found necessary to place arsenate of lead, fixed nicotine and spray oils under control, in order to ensure that available supplies are utilized for essential purposes. Considerable attention was given to the possibility utilizing *local or locally-obtainable substitutes* to supplement the most important shortages. Fortunately, by-products obtainable from steel works and other factories appear to offer encouraging possibilities in some directions. Amongst other things it would appear as if petrol might give positive results as a substitute for carbon bisulphide in the fumigation of grain.

A considerable amount of research work has been done in connection with two kinds of *army worm*. From this work emerged the interesting fact that these insects, like the migratory locust, show a phase variation. This research work is of considerable theoretical and practical importance in regard to the problem of the origin and causes of the severe outbreaks which occur from time to time— as was the case only last year.

Constant efforts are still being directed at securing valuable species of parasites from the United States for use against pests. In this connection it may be stated that during the year liberations

of *Chelonus texanus* were made on an appreciable scale in the hope that it would be effective against the *Karroo caterpillar*.

Once again the *plant regulatory service* proved its value by preventing the introduction of new pests into the country. A great deal of difficulty was experienced, however, in connection with the *introduction of new forest pests in timber* imported from the United States of America. The danger lies in the fact that parts of certain consignments of timber have not been stripped of all the bark in which and under which formidable pests are harboured. Up to the present there are no indications that any of these pests have become established in the Union, and they are constantly being intercepted and destroyed by the quarantine service.

Considerable apprehension has been aroused by the damage caused by *Lyctus* beetles in the woodwork of new buildings and elsewhere where particularly susceptible kinds of timber from Central Africa are used on an appreciable scale. There is, however, reason to expect an early solution to this problem through protective chemical treatment of supplies at their source. At the same time good progress has been made with the chemical treatment of local infestations in woodwork and furniture in houses.

Infestations, particularly in woodwork, by the longicorn beetle, *Hylotrupes bajulus*, were encountered in Port Elizabeth and Cape Town. A special survey is at present being undertaken to serve as a foundation for a control plan. Local research has already given results on which a campaign can be conducted with confidence in the meantime.

One of the entomological problems which was accorded particular attention during the year is that of the *codling moth*. Despite the limited spraying materials available, spraying programmes were put into practice in the western Cape Province, and comprehensive studies were made in connection with the use of substances locally available ; one such study related to the emulsification of seal-oil, 12,000 gallons of which have already been manufactured this year for spraying purposes. Other materials were tested out and pyrethrum was cultivated on a small scale. In addition great progress was made with work in connection with the biological control of codling moth, and parasites will shortly be bred on a large scale.

Owing to seasonal conditions, the following *fungous diseases* were exceptionally severe: curly leaf in peaches; peach and apricot freckle; anthracnose and powdery mildew in vines, and also diseases in ornamental plants. A serious leaf disease was discovered in sultanas in the vicinity of Upington, and it has been found to be caused by a hitherto unknown fungus. As a result of timely action a dusting programme was drawn up and investigational work is being carried out on this disease. In so far as bacterial blight is concerned, a thorough technical investigation is being conducted in regard to the disease, and the application of control measures in the field was vigorously costinued.

A considerable amount of investigational work was carried out in connection with the identification of the most important viruses in potatoes. The control of bacterial wilt in tomatoes is being investigated from a cultural point of view. Field experiments were continued in an effort to obtain a substance which will check the disease in tomatoes, and also to determine the effect of various cultural practices on the disease. The control of kromnek in tobacco by means of close planting appeared to be successful. A large number of groundnut varieties and crossings of groundnuts were tested out for

their resistance to rosette disease, but all proved to be susceptible. It was found, however, that the position can be considerably improved by treating the seed with standard prophylactics. Peas also react well to seed-protection measures. At Port Elizabeth mycological research work was carried out in connection with diseases such as collar rot and gummosis in wattles and pines.

The work at the Buffelspoort Research Station was maintained and the inspection of citrus orchards for psorosis was continued. Orchards were examined in the Rustenburg, Marico, Brits, Pretoria, Fort Beaufort and Adelaide districts. Nearly 460,000 trees of five years and older were examined, and of these 972, or approximately 0·2 per cent., were found to be affected.

Locust Destruction.

During the past year it was necessary to conduct a campaign against the red locust only, since no outbreaks of hoppers of the brown locust occurred in dense swarm formation in any part of the Union.

The Brown Locust.—During the first half of the summer there was a noticeable increase in the number of locusts in the solitary phase in certain districts of the Karroo and the south-western Orange Free State. Consequently, hopper outbreaks were expected in these parts during the second half of the summer. From December 1942 to March 1943 small hopper swarms were observed in these areas. The hoppers remained in concentrated formation during the first three stages of development, but were subsequently considerably thinned out as a result of a severe drought as well as by locust birds, with the result that the groups broke up and hoppers in the later stages occurred only in scattered formation. In spite of good rains in March 1943, hopper infestations occurred on a very much smaller scale than was expected, and flying swarms were not observed before the winter. Although flying swarms did not appear before the winter, the locusts were nevertheless sufficiently dense in some districts, i.e. in the south-eastern part of the incipient hopper-outbreak areas, to cause hopper outbreaks in the solitary phase during the first half of the 1943-44 summer. In other parts of this area the number of locusts in the solitary phase remained small throughout the season.

In so far as the prospects for 1943-44 are concerned, the position may be summed up as follows:—

(1) Outbreaks of incipient swarms are expected early in summer in the following districts:—Steynsburg, Hofmeyr, Middelburg, Hanover, De Aar, Colesberg, Philipstown, Richmond and Fauresmith. In the western part of the incipient hopper-outbreak area, incipient swarms will appear later as soon as the hoppers of the second generation make their appearance.

(2) In the eastern part of the incipient hopper-outbreak area incipient swarms are expected to reach the flying stage by the middle of the summer and will in all probability penetrate into areas lying to the north and east of this region. These swarms will lay dense egg-nests. Towards the end of the 1943-44 summer incipient flying swarms may also be expected in the western part.

(3) The expectation is that outbreaks of hoppers in swarm formation will occur during the second generation in the eastern part of the above-mentioned incipient hopper-outbreak area, as well as

in some districts bordering in the north and east of this area; this will probably occur during the second half of the summer.

The Red Locust.—From August to October several fast-moving flying swarms invaded the Union, and reports of these were received from eleven districts. By December all these swarms had moved from the Transvaal to Natal, and one which flew over Winburg in the Orange Free State also reached Natal later on. These swarms were pursued in their flight across the Transvaal by large numbers of locust birds, and by the time they reached Natal their numbers had been considerably reduced. Consequently, the swarms slowly moved in a southerly direction in scattered formation.

At the end of September 1942 five large and ten small swarms were present in Natal and Zululand. During the following three months reports of their movements were received from numerous districts in Natal and Zululand, and one or two swarms penetrated into the three most northerly districts of Pondoland. Ovipositing took place in scattered formation in the Bizana, Flagstaff and Lusikisiki districts in December 1942 and January 1943.

Small flying swarms which remained behind in the sugar fields of districts like Eshowe and Lower Umfolozi began to oviposit as early as 20 October and continued to do so during November and the first part of December. The swarms which invaded Natal also started ovipositing during the second half of December. By the end of December most of the swarms had been broken up to such an extent that ovipositing occurred mostly in scattered formation. Hopper outbreaks were general from the middle of January and occurred on an extensive scale in the New Hanover, Pietermaritzburg and Nongoma districts. Small hatchings took place in the districts of Hlabisa, Lower Umfolozi, Eshowe, Mtunzini, Stanger, Inanda, Entonjaneni and Mahlabatini.

The campaign against hoppers was successfully concluded in most districts by the end of February, 1943. Poison bait was used with excellent results in all districts. In many places the hoppers hatched out in such scattered formation that extermination measures had to be postponed until the hoppers had reached the third or fourth stage. Even in such cases the bait was successful, and no damage worth mentioning was done to the veld and crops. Indeed, the whole campaign in Natal, Zululand and Pondoland was conducted in a very effective manner, and the Department wishes to avail itself of this opportunity to express its gratitude to all magistrates, farmers and natives for their willing support and active co-operation.

In so far as the prospects for the 1943-44 season are concerned, it is gratifying to be able to state that since the conclusion of the campaign no reports of flying swarms of the red locust have been received from any part of the Union. During the winter, however, flying swarms were present in several areas to the north of the Union, and it may, therefore, be expected that swarms will again invade the Union when the pre-hatching movement to the south commences. In all probability such an invasion will take place on a small scale.

The total expenditure of the State on locust destruction during 1942-43 was less than £3,700. This compares very favourably with the colossal amounts which, until even a few years ago, still had to be spent on this pest.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.
Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmers' Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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* Price Review for January, 1944.

SLAUGHTER STOCK.—As a result of larger supplies, prices on the Johannesburg and Cape Town markets declined throughout. Prices on the Johannesburg market declined from 73s. 8d. per 100 lb. estimated dressed weight *on the hoof* to 69s. 11d. for January; good mediums from 69s. 2d. to 66s. 2d.; mediums from 62s. 10d. to 60s. 11d. and compounds from 57s. 10d. to 55s. 8d. On the Cape Town market prices declined from 89s. 2d. per 100 lb. estimated dressed weight to 82s. 10d. for January and good mediums from 82s. 2d. to 77s. 8d. Good supplies were also present on the Durban market, particularly owing to an increase in the number of direct consignments to butchers. As a result of a good demand, maximum prices were, however, always obtained, except in the case of undergrade beef.

Slaughter Sheep.—Supplies on the markets were moderate and although prices declined slightly on the Johannesburg market, it remained more or less on the same level on the other markets. Prime merinos on the Johannesburg market averaged 12·4d. per lb. estimated dressed weight and prime lambs, 12·5d. per lb. On the Cape Town market 12·1d. per lb. was realised for prime merinos; 12·0d. for prime crossbreds and 11·8d. per lb. for prime lambs, whereas on the Durban market, the prices were 10·8d. per lb. carcase weight for prime sheep and 11·3d. per lb. for prime lambs.

Slaughter Pigs.—Exceptionally heavy supplies of all classes of slaughter pigs were present on the markets and as a result prices dropped throughout to quite an extent. On the Johannesburg market 7·3d. per lb. live weight was realised for baconers during January as compared with 7·7d. for December and for prime porkers 7·6d. as against 8·1d. for December. On the Durban market the prices for prime baconers declined from 10·3d. per lb. dressed weight to 8·7d. for January and prime porkers from 11·3d. to 10·9d. per lb.

Grain and Hay.—Relatively large quantities of hay came on the markets although smaller than during the previous month and, on the

* Al prices mentioned are average.

whole, prices showed a slightly rising tendency. Cape lucerne on the Johannesburg market realised 5s. per 100 lb. compared with 4s. 6d. for the previous month, while the price of teff increased from 5s. 4d. to 5s. 10d. per 100 lb. Prices of Kaffircorn experienced a slight decline in price and realised an average of 20s. 3d. and 20s. 5d. per bag free-on-rail for January.

Potatoes.—Larger supplies were present on the markets during the month under review and particularly offerings of Highveld potatoes increased. Locally produced potatoes were generally of poor quality. National Mark consignments increased notably during the month. Prices, particularly of the poorer qualities, consequently experienced a sharp decline. On the Johannesburg market the prices of National Mark Grade 1 No. 2 and 3 declined from 21s. 4d. and 21s. 1d. per bag to 16s. 11d. and 16s. 7d. respectively for January. On the Durban market, Natal No. 1 realised 22s. 9d. per bag for January compared with 25s. 11d. for the previous month, while Cape No. 1 experienced a decline from 18s. 8d. to 17s. 6d. per bag for January.

Onions.—Supplies of Cape onions increased on all markets and in general prices declined while on some markets, e.g., the Durban market, the decline was particularly sharp. Prices for Cape onions realised were: 10s. 9d. per bag on the Johannesburg market, 12s. 3d. on the Pretoria market, 11s. 7d. on the Durban market, and 8s. 8d. on the Cape Town market.

Tomatoes.—Supplies consisted mostly of locally produced tomatoes. The quality in general was satisfactory and prices maintained the same level as during December. National Mark No. 1 realised 4s. 3d. per tray on the Johannesburg market, for the month under review and ordinary tomatoes 1s. 6d. per tray. On the Cape Town and Durban markets tomatoes averaged 2s. 2d. and 1s. 2d. per tray, respectively.

Vegetables.—In general the total offerings of vegetables were somewhat smaller than during the previous month. The supply consisted mainly of local produce. Stable prices were realised throughout.

Fruit.—Deciduous fruit was predominant and consignments by the Deciduous Fruit Board, especially of grapes and pears, increased during the month. Supplies were, however, by no means large and high prices were realised. Mangos, bananas and pineapples were supplied in fair quantities while other varieties were scarce.

Eggs and Poultry.—Offerings of eggs decreased while the demand sharpened resulting in higher prices. New laid eggs realised an average price of 2s. 4d. per dozen for January on the Johannesburg and Durban markets. The demand for poultry was weaker and prices declined somewhat.

Index of Prices of Field Crops and Pastoral Products.

As is shown elsewhere in this issue this index declined to 158 during January 1944 from 160 in December 1943. (Basic period 1936-37—1938-39). The most important price declines occurred in the following groups:—

(*a*) "Other Field Crops", e.g., from 204 to 179 in January. Due to the decline in price of potatoes and onions during the month.

(b) *Slaughter stock* from 194 to 183 due to the decline in prices of all classes slaughter cattle and pigs.

The most important price increase occurred in:—

(a) *Hay.*—From 124 to 137, as a result of the slight increase in prices during the month of lucerne and teff-hay.

(b) *Poultry and poultry products.*—From 200 to 216, mainly as a result of the increase in the prices of eggs.

Indices of Prices Paid for Certain Farming Requisites.

THESE indices, as shown elsewhere, have been revised and slightly amended in some cases. This became necessary owing to the fact that many of the articles of which the prices were used in the compilation of these indices are no longer procurable or other articles have been substituted for these. This is particularly the case with implements and spare parts of which a large proportion is now locally manufactured.

According to these then the index of implements and spare parts rose from 142 to 154 from October 1943 to the end of January 1944, and the prices of bags from 249 to 303. The index of prices for fertilizers again declined from 168 to 161 over the three months and that of feeding stuffs from 155 to 149. The remaining groups show little or no change.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938–39	92	107	96	89	79	102	106	92	93
1939–40	86	107	77	95	115	105	106	89	103
1940–41	109	113	106	156	102	108	110	104	108
1941–42	121	134	143	203	102	131	134	145	123
1942–43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (*a*)	Fertilizers. (*b*)	Fuel. (*c*)	Bags. (*d*)	Feeding Stuffs. (*e*)	Fencing Material. (*f*)	Dipping and Spraying Material. (*g*)	Building Material. (*h*)
Base—								
1936–38........	100	100	100	100	100	100	100	100
1939...........	105	106	98	146	90	114	100	103
1940...........	120	139	117	171	95	176	112	124
1941.	124	170	124	175	109	208	115	144
1942—								
January........	121	146	125	188	115	229	117	164
April..........	122	146	134	194	127	228	117	165
July...........	124	146	146	220	147	231	118	167
October.........	124	146	152	224	145	230	118	171
1943—								
January........	126	145	154	232	144	238	123	[illegible]
April..........	126	145	154	234	150	238	123	[illegible]
July...........	126	145	156	235	155	239	131	[illegible]
October........	142	168	156	249	149	240	131	[illegible]
1944—								
January (*j*).....	154	161	156	303	149	240	131	182

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

(*a*) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land sides, mouldboards, knife, pitman, guard.
(*b*) Superphosphate, ammonium sulphate, potash-muriate, bonemeal.
(*c*) Petrol, power paraffin, crude oil, grease, lubricating oil.
(*d*) Woolpacks, grain bags, sail twine, binder twine.
(*e*) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.
(*f*) Fencing wire, standards, baling wire.
(*g*) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
(*h*) Corrugated iron, deals, cement, lime, flooring boards.
(*j*) Preliminary.

Average Prices of Slaughter Cattle.

SEASON (1st June to 31st May).	BEEF per 100 lb.									
	Johannesburg. (*a*)				Cape Town. (*a*)			Durban. (*b*)		
	Prime. No. 1.	Good Medium. No. 2.	Medium. No. 3.	Compound. No. 4.	Prime. No. 1.	Good Medium. No. 2.	Medium. No. 3.	N.M. Good. No. 1.	Good Medium. No. 2.	Medium No. 3.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	39 0	36 3	33 9	31 7	36 8	34 3	31 11	—	33 0	—
1939–40.........	38 5	35 5	33 0	30 10	37 11	35 4	32 0	—	33 7	—
1940–41.........	41 4	37 11	34 11	32 4	41 1	38 0	34 9	—	34 0	31 3
1941–42.........	52 1	47 4	42 6	38 4	52 3	48 1	43 1	45 9	—	40 3
1942–43.........	63 2	57 9	51 5	46 1	60 4	56 3	50 6	55 11	—	45 6
1943—										
January.......	62 10	57 2	52 1	47 10	63 11	59 3	53 9	55 9	51 0	45 6
February......	60 11	55 8	49 11	44 5	62 8	58 3	51 9	55 1	50 4	43 11
March.........	59 2	54 4	48 1	43 4	57 8	53 8	47 8	52 1	46 8	41 0
April..........	60 8	55 8	48 4	43 4	59 7	55 0	49 5	52 5	47 2	42 1
May...........	59 11	55 3	48 11	43 9	61 3	56 11	51 0	52 6	47 6	42 6
June..........	58 2	54 9	46 10	46 2	58 11	54 8	49 2	52 6	47 6	42 6
July..........	66 10	63 11	60 3	55 0	66 5	60 2	53 5	57 10	50 5	45 6
August........	70 8	65 3	60 6	56 0	75 4	67 9	58 10	63 0	55 0	49 0
September.....	76 11	72 10	69 0	65 8	76 4	68 7	60 5	63 0	55 0	49 0
October........	81 11	77 10	70 8	65 8	78 11	72 0	64 11	63 0	55 0	49 0
November.....	81 0	75 5	69 5	63 10	87 10	78 11	69 3	63 0	55 0	49 0
December......	73 8	69 2	62 10	57 10	89 2	82 2	72 2	63 0	55 0	49 0
1944—										
January.......	69 11	66 2	60 11	55 8	82 10	77 8	68 0	63 0	55 0	49 0

(*a*) Estimated dressed weight of cattle as sold on the hoof.
(*b*) Dressed weight of carcase sold on the hook. According to new meat regulations as from October, 1942, No. 1 corresponds approximately to N.M. good, No. 2 to good medium, and No. 3 to medium.

Average Prices of Sheep and Lambs.

SEASON (1st June to 31st May.)	MUTTON (per lb.). Johannesburg. (a) Merino Hamels. Prime.	Medium.	Cross-breds. Prime.	Cape Town. (a) Merino. Prime.	Persians and Cross-breds. Prime.	Durban. (b) Prime. No. 1.	Medium. No. 2.	LAMB (Prime) (per lb.). Johannesburg. (a)	Cape Town. (a)	Durban. (b) No. 1.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938-39	6·3	5·5	5·8	5·8	5·9	6·1	5·3	6·7	6·4	8·3
1939-40	6·5	6·0	5·9	5·9	5·9	6·3	5·5	6·8	6·6	8·0
1940-41	6·7	6·1	6·2	6·1	6·3	6·5	5·8	7·0	6·6	8·0
1941-42	8·3	7·4	7·5	7·7	7·6	7·7	6·9	8·6	8·1	8·8
1942-43	11·5	9·8	9·8	10·7	10·5	10·5	9·6	11·4	10·8	11·3
1943—										
January	11·2	9·4	9·5	10·8	10·4	10·7	9·9	11·2	10·8	11·1
February	10·5	8·6	8·2	10·1	10·1	10·5	9·4	10·4	10·2	11·0
March	11·5	9·8	9·0	11·7	11·1	10·2	9·1	11·5	11·3	10·9
April	12·0	10·2	9·5	12·4	11·6	10·3	9·5	12·0	11·8	11·0
May	12·0	10·3	9·6	11·1	11·1	10·3	9·5	11·8	11·2	11·0
June	11·4	10·2	10·4	10·8	11·0	10·3	9·5	11·8	11·3	11·0
July	11·4	10·3	10·3	11·4	11·2	10·5	9·8	11·7	11·2	11·1
August	11·8	10·2	10·8	12·4	12·2	10·8	10·0	11·9	12·6	11·3
September	12·8	10·9	12·0	12·0	12·0	10·8	10·0	13·1	12·2	11·3
October	11·5	9·6	10·1	11·3	11·2	10·8	10·0	12·1	11·5	11·3
November	11·9	10·1	10·6	10·9	11·1	10·8	10·0	12·6	11·4	11·3
December	12·9	11·4	11·5	11·6	12·0	10·7	10·0	12·9	12·1	11·3
1944—										
January	12·4	10·4	10·9	12·1	12·0	10·8	10·0	12·5	11·8	11·3

(a) Estimated dressed wiight as sold on the hoof.
(b) Dressed weight on the hook.

Average Prices of Pigs.

SEASON (1st June to 31st May).	Johannesburg. (a) Baconers. Prime.	2nd grade.	Porkers. Prime.	2nd grade.	Stores.	Durban. (b) Baconers. Prime.	2nd grade.	Porkers. Prime.	2nd grade.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938-39	6·2	5·7	5·3	4·9	5·0	6·7	6·2	7·6	6·6
1939-40	5·6	5·1	5·2	4·7	4·8	6·7	6·1	7·2	6·3
1940-41	5·4	4·5	4·5	3·8	4·0	6·8	6·3	7·1	6·3
1941-42	6·6	5·2	5·1	4·0	4·5	8·1	7·1	8·1	6·9
1942-43	8·6	7·5	7·2	6·0	6·9	10·3	9·0	10·6	9·1
1943—									
January	8·4	7·7	7·8	6·6	8·4	9·4	8·5	10·3	9·1
February	8·8	7·8	7·4	6·3	8·0	10·2	9·3	10·5	9·4
March	8·8	7·7	6·8	5·7	6·2	11·4	10·1	11·3	9·9
April	9·1	8·1	6·9	5·9	6·5	11·2	9·7	11·5	9·7
May	8·7	7·8	7·6	6·7	6·6	11·9	10·7	12·1	10·4
June	8·7	7·8	8·3	7·4	7·4	11·4	9·9	11·4	9·8
July	8·6	7·7	8·4	7·1	7·1	10·6	8·8	11·9	9·2
August	8·7	7·5	8·4	7·2	7·2	10·8	9·1	10·0	8·5
September	8·9	7·6	7·7	7·0	7·4	10·9	9·9	11·3	10·2
October	8·8	7·7	7·7	6·9	7·8	10·3	8·6	10·0	8·4
November	8·4	6·4	7·7	6·8	7·5	10·2	8·8	10·7	8·8
December	7·7	6·4	8·1	7·2	7·3	10·3	8·8	11·3	9·8
1944—									
January	7·3	6·0	7·6	6·3	6·5	8·7	7·3	10·9	9·1

(a) per lb. live weight.
(b) per lb on the hook.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season (1st July to 30th June).	Johannesburg. Transvaal. No. 1.	Johannesburg. Transvaal. No. 2.	Johannesburg. N.M. Grade I. No. 2.	Johannesburg. N.M. Grade I. No. 3.	Durban. Natal. No. 1.	Durban. O.F.S. No. 1.	Pretoria. Transvaal. No. 1.	Cape Town. Cape. No. 1.	Cape Town. Cape. No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939-40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940-41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941-42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942-43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 6	17 6	12 11

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

Season. (1st July to 30th June).	Onions (120 lb.). Johannesburg. Transvaal.	Onions. Johannesburg. Cape.	Onions. Cape Town. Cape.	Onions. Pretoria. Cape.	Onions. Durban. Local.	Onions. Durban. Cape.	Sweet Potatoes. (120 lb.). Johanburg. Table.	Sweet Potatoes. Durban.	Sweet Potatoes. Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939-40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941-42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942-43	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June	17 3	17 4	15 3	18 1	12 0	18 9	8 5	8 6	9 2
July	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
November	16 5	—	19 7	—	22 9	25 1	13 5	11 11	10 8
December	12 11	13 10	9 3	15 1	18 6	16 6	12 0	10 5	9 9
1944—									
January	11 3	10 9	8 8	12 3	9 6	11 7	14 1	9 4	11 10

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1st July to 30th June).	Cabages (Bag). (a)			Cauliflower (Bag). (a)			Tomatoes (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941–42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942–43	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2

[illegible] vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb. Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.).			Green Peas (Pockets 20 lb.).			Carrots (Bag). (a).		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940–41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941–42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942–43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	18 2
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	19 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 11	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11
December	2 1	0 6	2 5	3 8	1 5	5 10	8 6	7 0	7 7
1944—									
January	1 9	1 2	3 5	4 7	1 6	6 7	7 4	3 5	7 10

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb. Cape Town, 90 lb.: and Durban, 120 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1st July to 30th June).	Eggs. Johannesburg, New Laid. Per Fozen.	Eggs. Durban, New Laid. Per Dozen.	Eggs. Cape Town. Per 100.	Fowls (Live, each). Johannesburg.	Fowls (Live, each). Durban.	Fowls (Live, each). Cape Town.	Turkeys (Live, each). Johannesburg.	Turkeys (Live, each). Durban.	Turkeys (Live, each). Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942-43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 8
1944—									
January	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.). Johannesburg (a). Cape.	Lucerne (per 100 lb.). Johannesburg (a). Transvaal.	Lucerne (per 100 lb.). Cape Town 1st. grade.	Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.). F.o.r. Producers Stations. K1.	Kaffircorn in bags (200 lb.). F.o.r. Producers Stations. K2.	Dry Beans (200 lb.). bags. Johannesburg (a). Speckled Sugar.	Dry Beans (200 lb.). bags. Johannesburg (a). Cow Peas.	Dry Beans (200 lb.). bags. Johannesburg (a). Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2

(a) Municipal Market.
(b) Seasonal year for Kaffircorn 1st June–31st May; Dry Beans 1st April–31st March; Lucerne and Teff 1st July–30th June.

SPECIAL SEED-PRODUCTION NUMBER

◆ ◆ ◆

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[*Photo on Cover by S.A.R. & H.*]

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted —

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.
Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmers' Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

Special Seed-Production Number

The Basis of our Food Supplies.

Foreword by Prof. A. M. Bosman, Director of Animal and Crop Production.

THE extent to which the Union was dependent on other countries for certain seeds, was brought home to us immediately after the outbreak of war. Since seed is the basis of a nation's food supplies, the Department of Agriculture and Forestry lost no time in taking steps to promote the production of the most suitable types of field, garden, pasture and other seeds. It therefore gives me great pleasure to submit to our farmers this special issue of Farming in South Africa *in which an account is given of the measure of success achieved.*

We can look back with a measure of satisfaction upon the problems which caused no little anxiety some three years ago. Several kinds of seed, as for example, that of chicory and certain vegetables, all of which had formerly to be imported, are now produced locally, and conclusive proof is now forthcoming that it is indeed possible to produce seed of high quality in the Union. We have, in fact, even been able to assist neighbouring territories. The measures taken to increase and to safeguard seed-potato and peanut supplies were carried out with success, and all things considered, the position to-day, in so far as seed is concerned, is reasonably satisfactory. In order to maintain a high standard of food production, it is essential that adapted species and varieties should be cultivated—hence the hints and recommendations given in this issue. These recommendations are based on practical experience and careful research work carried out at our experiment stations.

It might also be stated here that the standardization of seeds will have to play a very important part in the future. It is fitting, therefore, that a start should have been made in this direction with an important crop like lucerne.

Seed production, however, is not the only matter of importance; the protection of seed against insects and disease deserves equal attention.

I wish to appeal to all farmers to grow only the most suitable kinds of all crops and to give them such treatment that the highest possible yields for both human and animal consumption can be expected. Methods of production have already been dealt with in previous special issues, viz., the summer-rainfall area (October 1942), the winter-rainfall area (March 1943), fruit growing (June 1943) and soil fertility (September 1943).

Increased food production for human as well as animal consumption is essential if the standard of nutrition of our nation is to be raised to the level required for the maintenance of good health.

A. M. Bosman

Director of Animal and Crop Production.

Lucerne-seed Subsidy Scheme.

THE exhaustion and depletion of the fertility of the arable lands of the Union, and particularly those of the old-established wheat areas of the Western Cape Province, is a matter which has caused anxiety for some considerable time. The most effective method for the restoration and maintenance of the fertility of the soil in the case of land used for cereal growing, is the adoption of a system of rotation with suitable crops, among which lucerne is the most important.

In order to encourage this sound farming practice and assist farmers in arresting the process of exhaustion and deterioration of their arable land, the Government has decided to institute a lucerne seed subsidy scheme for a period of ten years in areas and on farms where the growing of winter cereals is part of the established farming system. The basis of the scheme is the payment of a subsidy on a maximum of 10 bags of lucerne seed per farm per year. This quantity will be sufficient to put at least 50 morgen under lucerne.

Farmers are advised to extend systematically the area put to lucerne. This will enable stock to play a greater part in the areas where winter cereals are grown, and such a practice, in turn, will no doubt have a beneficial effect on the fertility of the soil. Attention must also be focussed on the fact that experience has demonstrated that very good results are obtained if the lucerne is sown together with the wheat during the first year. This system can further be advocated because it enables the lucerne to benefit from the fertilizers used for the wheat.

The subsidy to be paid by the State will amount to 60 per cent. of the cash purchase price (excluding transport costs) of standard lucerne seed, to be used for the sowing of lucerne in rotation with wheat and other winter cereals under dryland conditions, on soil regularly put to winter cereals. The subsidy will only be granted to the registered owner of a farm who undertakes to—

(*a*) sow and treat the lucerne strictly in accordance with the requirements of the Cóllege of Agriculture serving his area;

(*b*) maintain the lucerne for at least three years;

(*c*) make the most effective use of the lucerne crop on his farm as a stock feed;

(*d*) repay to the Department of Agriculture and Forestry the full subsidy, with interest at the rate of 4 per cent. per annum from the date it was paid, if he fails to observe any of the conditions of the scheme or departs from the conditions without prior approval of the College of Agriculture.

The necessary application forms are now available. Farmers must apply on the prescribed forms for the subsidy at the Colleges of Agriculture serving their respective areas. The Colleges will also exercise control in respect of the suitability and preparation of the soil applicants intend putting to lucerne. The subsidy is granted only on the recommendation of the College of Agriculture, and will be paid out on receipt of proof that the seed has been purchased, such proof to be in the form of paid accounts. The account must further be accompanied by a statement to the effect that the lucerne has been purchased for the sowing of lucerne for the purposes of the scheme.

FARMING IN SOUTH ... AFRICA

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Editorial:

The Importance of Good Seed.

IN the production of crops of all kinds, the importance of good seed is too well known to require comment, yet the knowledge is all too often not applied in practice. With the exception of potatoes and a few other crops, the cost of seed is a minor item in the total cost of production, and the quality of the seed used is one of the factors in production under human control. Nevertheless, the losses due to poor seed probably exceed in value the total cost of all the seed used in our agricultural industry.

As a class, our agriculturists are not seed conscious to the degree that good farming demands. This is probably due in large measure to the ease with which supplies have in the past been obtained from overseas, and now that we have been thrown on our own resources there is a general awakening of interest, which, one hopes, will continue and expand in the future.

On the other hand, the fact should be realized at the outset that commercial seed production is a specialized undertaking in which the interest, knowledge and skill of the producer are decisive factors to success. The inferior quality of some of the seed produced in this country to-day is due not to unsuitability of soil or climate, but to the lack of fundamental knowledge as to procedure. That seed of the highest quality can be produced has been demonstrated over and over again. In the first place we have for a long time been independent of overseas supplies as regards seeds of our main field crops, and rightly so, for imported types are often entirely unadapted to our local conditions. Our lucerne seed is in demand for export, and under the pressure of necessity great strides have recently been made in the production of vegetable seeds, so much so that we are to-day in a position to assist neighbouring territories with seed of certain vegetable types, such as onions, cabbage, cauliflower, pumpkins, etc.

In fact, it is no exaggeration to say that seed production as a new agricultural industry is being born in this country, with possibilities which challenge the enterprise, initiative and capabilities of farmer and seed merchant alike. However, for such an industry to survive and develop in the face of the keen competition which is bound to come after the war, it is imperative that we should build conscientiously on firm foundations. The main requirement is one of technical knowledge and painstaking effort, not only to maintain the vigour and purity of varieties, but also to breed superior types better adapted to our climatic conditions.

Of our field crops the potato represents the greatest problem, for the cost of seed per morgen is high and success or failure often depends entirely on the quality of the seed, in the sense of its vigour and freedom from degeneration diseases. The potato industry has hitherto existed on a basis of imported seed, at considerable cost to

the country, but recent discoveries give good reason to hope that it might be possible, in certain localities, to grow seed potatoes of as good, if not better, quality than those imported. The Department has such a scheme under consideration, and with the co-operation of the Seed Growers' Associations it is highly probable that in the near future we shall be able to reduce imports to a minimum, if not to dispense with them entirely, and to provide high-quality seed to potato growers generally.

Apart from the primary essential of good breeding in the production of seed, with its necessary requirements of meticulous care in selection, elimination of weeds, isolation of seed plots from other fields, etc., there is vast room for improvement in the cleaning, storage, and chemical treatment of seed to control insect pests and fungous diseases. Many of our most serious weed pests are spread through the medium of contaminated seed, as witness dodder in lucerne and watergrass or "uintjies" in teff, and the application of better cleaning methods is an urgent necessity. Chemical treatment to prevent ravages by weevils, grain moth and diseases such as smut in wheat, scab on potatoes and many others seldom fails to pay for itself and usually brings enhanced returns.

Finally, there is the obvious need for testing seeds of which the germination is in any doubt. The grower himself can test most seeds at home without the use of complicated apparatus, and thus often save himself the trouble and expense of having to resow or avoid crop losses through a poor germination. But the laying down of standards of germination and purity and the enforcement of such standards by regulation require facilities of a national character. The establishment of the Seed Testing Station at the Potchefstroom College of Agriculture is a long step forward in this direction, even though a great deal remains to be done before the Station can fulfil its rightful functions.

(Dr. A. R. Saunders, Senior Professional Officer, Potchefstroom College of Agriculture.)

Vegetable Seed.

The first settlement at the Cape justified its existence in the eyes of Van Riebeeck by the fact that, within a year of its foundation, the first seed harvests were obtained, as reported in his famous diary, and that this seed supplied the much needed vegetables.

Gradually, however, an important change took place. With an increase in the number of new settlers a feeling of dependency on seed supplies from the mother countries developed. Extensive farming operations were less exacting than horticulture and thus the art of plant breeding never developed at this time as extensively as in the European countries. In times of stress the country was frequently forced to depend on its own resources, but on the return of normal conditions, importation was resumed. Thus there was no stimulus for the evolution of plant breeders and seedsmen, as witnessed in other countries during the last century.

Efforts to establish a South African seed industry were made during the first quarter of this century, but these failed as a result of the world-wide economic crisis after the Great War, which caused uncontrollable fluctuations in the price of seed. Imported seed of good quality could be sold far below the South African cost of production.

VEGETABLE SEED.

The paucity of growers, well versed in their business, and the fact that much seed used to be collected as a catch-crop, frequently had an adverse effect on quality, and this was a contributing prejudicial factor against South African seed. The fact was, however, overlooked that many varieties of seeds were already being grown for generations in this country and some of this seed found a ready export market beyond our shores.

The prejudice went so far that typical South African seeds were exported to plant breeders in other countries and returned here, often with foreign variety names, and disposed of at enhanced values.

The country was dependent to a very large extent on the continuous importation of vegetable seeds. During 1939-1940 a total quantity of between 800 and 1,000 tons in weight was acquired in this manner, involving an expenditure of at least £1,000,000.

During the war period a very important change took place. Before the end of 1940 importations from Europe had ceased, and the increasing difficulties experienced with shipping facilities soon demonstrated the danger involved to the Union in relying solely on overseas suppliers.

South Africa had again to rely on its own resources. It should be recorded that although private enterprise realised the opportunity, a nation-wide effort was required to meet the extensive demands for seed.

The Division of Horticulture had by this time surveyed a programme of production which was adjusted to the Union's needs. This programme provided for the immediate production of the most important vegetable seeds, and this has gradually been extended to include all other major vegetables. The basis of this production programme was developed from information supplied by the members of the Seedsmen's Association of South Africa, and it is gratifying to record that a sufficient number of farmers signified their willingness to undertake seed production as a national measure.

Though various production problems still require close attention, it may be stated that imports for the year 1944 need not exceed 20 tons in weight. To a very large extent the Union has become self-supporting and has been able to undertake to supply the essential vegetable seeds to adjacent territories. These trade relations may prove of material assistance in further developing and maintaining the Union's seed industry.

After the war the seed industry should carry on. The exchange of essential commodities will be governed, however, by international agreements and no promise of any protective measures can be made. Growers who have become fascinated by the possibilities of breeding and selection of plants, will undoubtedly form the essential nucleus of a permanent South African seed industry.

(Dr. J. W. Pont and H. van Elden, Division of Horticulture.)

How to Test Seed at Home.

J. Sellschop, Professional Officer, College of Agriculture, Potchefstroom.

A knowledge of the quality of the seed available for planting is of considerable importance if good stands are to be assured in fields and seedbeds. Simple, interesting tests, which will disclose the viability and healthiness or otherwise of the seed can easily be carried out in the home. Though some grass seeds may present difficulties, seeds of the more common crops and vegetables germinate readily and can be tested within a few days.

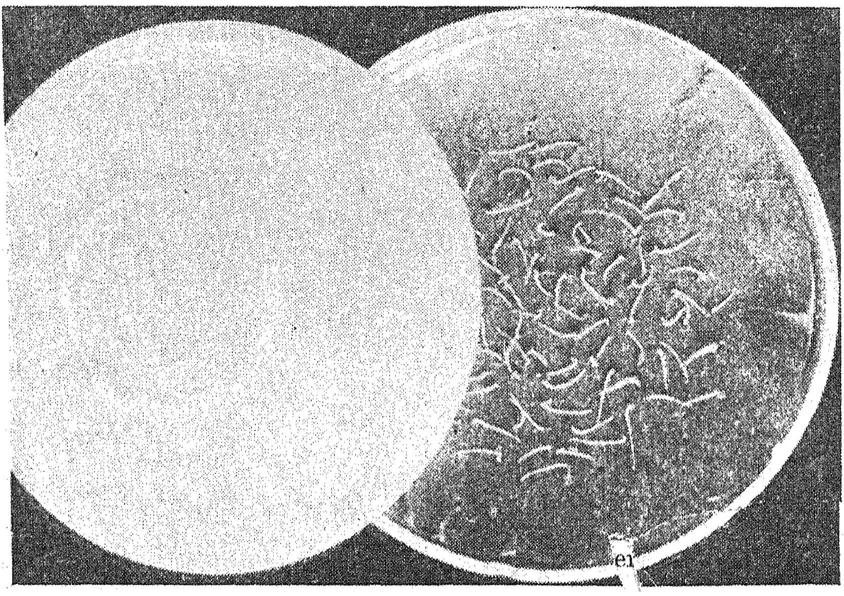


FIG. 1.—The plate or saucer method for testing seeds at home.

First of all a thoroughly representative sample must be obtained. This is done by taking small quantities of seed from several parts of the container or containers of the seed to be tested. After they have been well mixed, one hundred seeds are counted off indiscriminately, without selection as to the appearance of the seed. The value of the test is enhanced by testing a second or third hundred seeds.

Testing Methods.

(*a*) *The Saucer.*—Small seeds such as lucerne, Sudan and rye grass, wheat and cabbage are generally spread evenly and more or less separated from each other, on moist blotting paper, absorbent cloth, or clean baked sand in a deep plate or saucer (Fig. 1). To provide good growth conditions, such as a moist atmosphere, warmth and darkness, a second plate or saucer is inverted over the first. This simple germinator is then placed where day and night temperatures do not fluctuate violently. A sunny window-sill or shelf directly over a stove are generally too warm during the day and too cold during the night to permit normal germination of the more common field and garden seeds. Sufficient water should be supplied to the substratum of blotting paper, cloth or sand, whenever required to

keep the seeds moist, but excess moisture should be avoided. Beet and mangel-wurzel seed have to be soaked in water for two to three hours before they are placed in the germinator. The top plate, or saucer, should be removed daily to permit aeration and only for as long as it is necessary for the moistening of the substratum, or the removal of germinated seedlings. Only those that have formed normal radicles or rootlets are counted out, so that their rootlets do not become entangled with those still germinating. The remaining ones may then be well separated from each other if some are infected

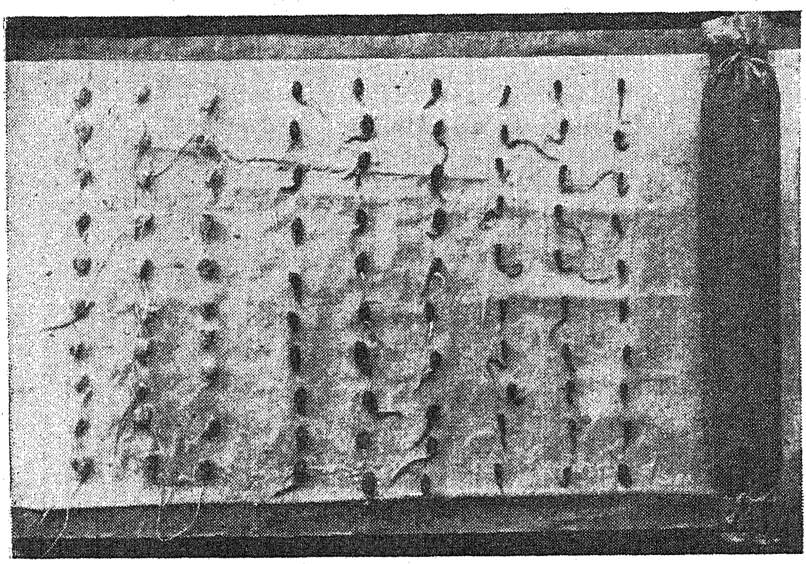


FIG. 2.—The " rag doll " seed germinator. The unrolled " doll " shows, from left to right, 3 rows each of maize, groundnuts and sunflower seeds germinating. On the right is a " doll " rolled up.

with moulds. After three to six days it will be abundantly clear what the actual value of the tested seed is.

(*b*) *The rag-doll.*—A " rag-doll " provides more space than plates and is, therefore, more useful for the testing of large seeds such as maize, beans, peas and groundnuts. All that is required is a strip of thick packing paper, 24 to 30 inches long and about 12 inches wide, and a piece of old linen or thick muslin of more or less similar size. The strip of cloth is first boiled for a few minutes, then wrung out and smoothed out over the piece of paper. The seeds are spaced 1 to 2½ inches apart in regular rows on the cloth. A suitable arrangement is obtained by placing ten seeds along the left-hand edge of the cloth and ten along the upper edge before the rest of the cloth is covered. Later examination of the seed is facilitated if they are laid down with their germs pointing to the lower edge of the cloth, which should be marked accordingly. Maize seeds should, furthermore, be laid down with the germs facing the cloth. The " doll " of paper, cloth and seed is then rolled lightly across its length and tied at both ends. If the cloth is somewhat dry it ould be sprinkled with clean water before the rolling is done. The ed " doll " is then stood upright, with the end marked " bottom " awards, in a wide-mouthed bottle, tin or other suitable container, ept under the conditions prescribed for the plate germinator.

factors. Very often the varieties grown are not adapted to the area and produce good yields only when rainfall conditions are exceptionally favourable. It is always a better policy to select single-stemmed, drought-resistant varieties than varieties which produce higher yields only during the few favourable seasons.

Besides resistance to drought, the choice of suitable varieties is also determined by the time when the first regular rains arrive in spring, the length of the growing season and the purpose for which the maize is grown. Generally speaking, it may be accepted that varieties which mature in 130 to 150 days will produce higher yields per morgen than earlier varieties, provided they can be planted in time and that the distribution of the rainfall during the growing season is favourable. Should the rains arrive late, however, the choice will necessarily have to be confined to early varieties which reach maturity in 100 to 120 days.

Apart from rainfall, the choice of a suitable variety also depends on the purpose for which it is grown. For human consumption, preference is given to white varieties, but for stock-feeding purposes the yellow varieties are usually chosen owing to the carotin and higher vitamin content of the grain.

The farmer for his part prefers a variety which is drought resistant, well adapted even to comparatively poor soils, and capable of producing a high yield per morgen.

All things considered, the following recommendations can be made in regard to suitable white and yellow maize varieties for the highveld and adjacent maize-growing areas.

White Maize.

White Dent Varieties.—Of these a large variety is already in existence, and new strains are being bred from time to time, while others like Iowa Silver Mine, Leguana, Ladysmith White, etc., are gradually disappearing from the scene. The following are the most popular white dent varieties and their growing periods:—

Hickory King (150 days), Potchefstroom Pearl (150 days), Improved Potchefstroom Pearl (135 to 140 days), Silver King (130 to 140 days), Early King (an Anveld type) (125 to 130 days), Anveld (125 to 130 days), Improved Anveld (115 to 120 days) and Wisconsin (120 days). On the central highveld where the growing season is comparatively short, the Anveld types also known under such names as Early King, Durr, Engelsman, etc., appear to enjoy the most popularity. In the western Transvaal the so-called Early King is favoured. When resistance to drought is desired, preference should be given to non-suckering and non-stooling varieties which generally produce only one large ear per plant. In this respect the improved Potchefstroom Pearl and the improved Anveld are two outstanding varieties. The latter can be strongly recommended for farmers desiring an early-maturing variety that yields fairly well.

White Flint Varieties.—In the Orange Free State and a few other areas, the white flint variety, known as the American White Flint, is fairly popular. This variety reaches maturity in about 130 days, and has apparently largely replaced the old White Cango, mainly owing to its higher yielding capacity.

In so far as the other flint varieties are concerned, farmers sometimes make enquiries about the White Botman and North Dakota. These varieties are likely to escape droughts, since their growing period is only about 100 days, but their yield capacity is so poor that they cannot be recommended in the better rainfall areas.

Yellow Maize.

Yellow Dent Varieties.—The outstanding yellow maize variety which is very strongly recommended for stock-feeding purposes in most parts of the maize belt is Sahara. Farmers with experience of this variety usually commend it, and experimental work carried out at the Kroonstad Experiment station has also shown it to be an exceptionally good yellow variety with a high grain-yield capacity, even during dry years. The suitability of this variety lies in the fact that it is fairly drought-resistant and produces high yields even on relatively poor soils. The plants are vigorous growers and usually produce large ears with plump grains. In view of the high tonnage of plant material obtained per morgen, it is also a good variety for silage purposes.

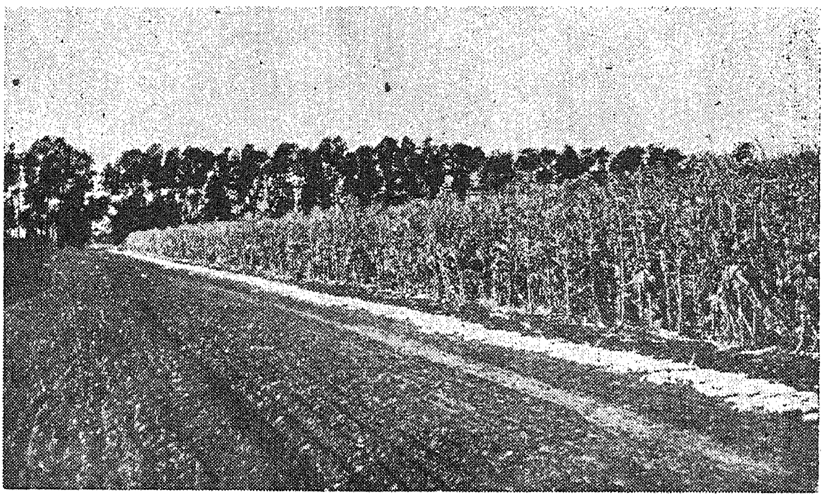


FIG 2.—Ears selected on the land spread out for final selection

Actually there are several related Sahara types known by various names, e.g., Golden Beauty, Baker's Success, Natal Yellow Horsetooth, Kroonstad "Robyn" and the ordinary Sahara. Some selections are also known by the names of the farmers who made the selection concerned, or who even crossed Sahara with other yellow varieties. Some of these strains differ in respect of their growing periods. So, for example, Golden Beauty, Baker's Success, Sahara and cognate selections usually mature in 140 to 150 days, Natal Yellow Horsetooth in 150 to 160 days and Kroonstad Ruby in 135 to 140 days. The latter is an improved Sahara variety bred at the Kroonstad Experiment Station.

Yellow Flint Varieties.—These varieties are quite popular in some areas, since they are early-maturing and are likely to escape intermittent droughts. The following are well-known varieties and their growing periods: Boesman, also known as Cincinnati (120 days), improved Boesman, also known as Hotnot (115 to 120 days), Natal 8-row (120 days), Eksteen (130 days), and Peruvian (110 to 115 days). As their growing periods indicate, these varieties are early-maturing and may still be planted fairly late in the season. They are also suitable for feeding poultry in cases where it is desired to feed the grain whole.

In parts of Natal and other areas where maize is generally severely infected with white blight, Natal 8-row, and also American White

Flint, White Cango, Hickory King and Natal Yellow Horsetooth apparently do better than other varieties.

Seed from Government Institutions.—The most important activities of the maize breeding institutions are directed at the production of new types or the improvement of certain varieties by special methods after which limited quantities of this seed are placed at the disposal of farmers. Their object is not, however, the large-scale production of the common varieties in competition with private growers.

Selection on the Land.

Selection of Seed.—If the farmer has, through experience and sound advice, determined what variety of maize is best suited to his neighbourhood and purpose and has succeeded in obtaining good seed from some source, he can, as has been mentioned above, further improve the productivity and adaptability of his maize by the regular selection of seed on the land. The best time to select seed is towards the end of March or in April, just when the plants begin to reach maturity. The most important characteristics to be taken into consideration in the selection of desirable plants, may be briefly summarized as follows:—

(1) Consider only those plants that grow in full competition with others.

(2) Select sound, strong plants with comparatively large and ripe ears, thick stems, broad green leaves, and strong, healthy root systems. Sucker shoots and numerous ears per plant are not desirable.

(3) Preference must be given to plants with only one large ear. The ear itself should be well-covered at the point and have a comparatively short stem.

(4) When stripped the ears must show plump, well-filled grains with a good lustre, a high percentage of horny starch, and have a healthy appearance. A dull colour and any signs of disease are most undesirable symptoms.

(5) The ears must be true to type and should show no signs of hybridization with other varieties. In order to prevent cross pollination, maize intended for seed production should be planted at least 800 yards from other varieties.

The selected ears should be stored in a dry, well-ventilated place in order to dry out completely, and then shelled. The irregular grains at the tip and butt end can first be removed, or otherwise the grains can be graded later on with the aid of a suitable grading machine to ensure that all the seeds will be of uniform shape and size, and not be broken by the planter plates. It should be borne in mind, however, that soundness of the seed is the primary consideration, and that no grading machine will improve poor seed. Selection on the land is the only safe way of obtaining good seed.

Tobacco Seed.

Pieter Koch, Principal Field Husbandry Officer, Division of Animal and Crop Production.

TOBACCO is one of the most specialised crops and requires specialised attention from the time seed is selected until the final product is ready for use. The plant is particularly sensitive to soil and climate which largely determine the quality of tobacco. The other important factors which enter into the production of a leaf of good quality are types, varieties, manuring, methods of cultivation, stage of ripeness at harvesting, curing and fermentation, all of which differ from the two previous factors (viz., climate and soil) in that they can readily be controlled if the grower has sufficient knowledge and practical experience. So many factors enter into the problem of successful tobacco growing that it is not easy to find localities which are ideal in every respect.

Seed Selection.

In this short review only the question of seed selection will be considered. Although the other factors are all of great importance the foundation of any plant is the seed. Poor seed will never produce good plants no matter how ideal the conditions may be. Tobacco growers in the Union have the privilege of obtaining well-bred, selected, graded seed of different types suitable for the various soils and climatic conditions of the country. As one selected plant yields enough seed for a morgen of ground it was possible for the Department of Agriculture and Forestry during the last ten or twelve years to produce enough good seed to supply the needs of practically all tobacco growers in the Union. This policy is being continued. However, it is advisable that every progressive tobacco grower should produce at least some of his own requirements and only obtain fresh seed from an experiment station when he finds that his tobacco has deteriorated or in case he wishes to produce new strains.

The tobacco crop requires careful seed selection, in accordance with the latest methods. The necessity for this is plainly evident to the attentive observer in almost any tobacco field, because of the great variation between the individual plants and the general lack of uniformity.

The farmer often finds plants in his field that approach his ideal of perfect or almost perfect plants. It is very desirable to produce uniform crops of the type of these so-called best plants, and it is within the reach of every grower to select the type of plant he desires to keep as seed plants. By preventing cross-fertilization he may secure uniform strains like the parent seed plants.

Necessary Steps.

Where a grower wishes to keep seed from his own crop for use during the ensuing season, he is advised to take the following steps:—

(1) Select about a dozen or more of the best plants, taking into consideration size of leaf, thickness of midrib, trueness to variety, type of plant, freeness from disease, yield, etc.

(2) Cover the terminal bud with an ordinary 12 lb. brown paper bag, and fasten the lower end with a string.

(3) Before covering up the terminal bud trim off all side branches, leaving the bud with its three terminal branches only. Remove all

flowers that have already opened or capsules that have already formed.

(4) The flower-heads which have been covered in this way must be opened and inspected at least once a week, as caterpillars often get into the bag and destroy all or most of the seed capsules which have formed.

(5) As soon as the capsules inside the paper bag have turned brown, but before they have completely dried out, the whole seed-head, paper bag and all, is cut off and hung up in an inverted position in the shed to dry further. As soon as the seed is completely dry, the capsules are broken and the seed collected.

(6) The flower-heads are covered in this way to ensure self-fertilization of the flowers and to prevent cross-pollination. No ill effects will result from continuous self-fertilization.

Government Seed.

If the grower does not wish to produce his own seed he may obtain his requirements from reliable seedsmen, tobacco co-operative societies and from certain Government Experiment Stations. Seed bred and selected at Government institutions for air- and flue-curing can be obtained from the Officer-in-Charge, Hartebeestpoort Experiment Station, P.O. Box 90, Brits; snuff tobacco varieties from the Officer-in-Charge, Subtropical Horticultural Research Station, P.O. Box 70, Nelspruit; air-curing varieties for the winter rainfall areas from the Field Husbandry Officer, P.O. Box 5, Oudshoorn; and Turkish Tobacco from the Stellenbosch-Elsenburg College of Agriculture, Stellenbosch, at 1s. per ounce payable in advance.

To facilitate distribution most of the tobacco co-operative societies have agreed to act as agents for the Department. They receive selected tobacco seed of different varieties in large quantities and dispose of it to their members.

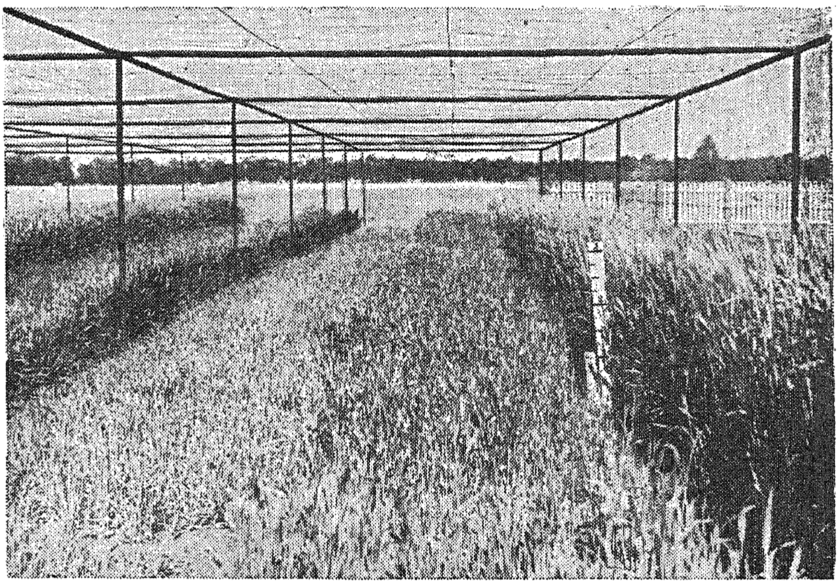
Formerly breeding and testing of new varieties and strains of tobacco were carried out at the Hartebeestpoort Experiment Station, but to-day these functions are undertaken by the Central Tobacco Research Station near Rustenburg, except for a part of the work for the Lowveld which is carried out at Nelspruit. When new and better varieties and strains have been produced and thoroughly tested out, multiplication of seed for general distribution is done at the Hartebeestpoort Experiment Station.

As tobacco is subject to many diseases, seed should be sterilized before sowing. The reader is referred to the article on seed sterilization elsewhere in this issue.

Winter Cereals.

Dr. P. D. Henning, Senior Lecturer in Field Husbandry, Dr. J. T. R. Sim, Professor in Field Husbandry, Stellenbosch-Elsenburg College of Agriculture, and F. X. Laubscher,* Research Officer, College of Agriculture, Potchefstroom.

ONE of the fundamental requirements for successful crop production is the use of good seed, i.e., seed which is pure and viable. It is equally important, however, that seed which is sown, should be derived from varieties which are adapted to the prevailing climatic conditions.



Wheat breeding experiments at the College of Agriculture, Potchefstroom.

In the hope of finding better varieties, farmers are often inclined to sow new types or varieties which do well in other localities. Their hope is seldom, if ever, realized, however, mainly because a selection (which is subsequently given a name and called a variety) is usually chosen for its suitability to a specific area, and consequently, may not yield the same results when grown under different conditions. It is a noteworthy fact, for example, that the same variety is seldom suited to both the winter and the summer-rainfall areas.

During recent years great progress has been made in the various grain-producing countries in connection with the breeding of rust-resistant varieties. Several of these varieties were imported and tested, and although most of them were also resistant to the local forms of stem rust, they nevertheless had shortcomings in other respects. As a rule, they mature too late. So, for example, the variety known as "Renown" which is to-day widely sown in the winter-rainfall area, is an early rust-resistant selection obtained from the original *Renown* which was imported from Canada and which con-

* With acknowledgements to Mr. J. B. Louw, of the Wheat Industry Control Board, Pretoria.

sisted of a mixture of early, late, rust-resistant and rust-susceptible types. The above facts once again emphasize the necessity for the thorough testing of varieties obtained from elsewhere before they are sown on an extensive scale. Owing to the numerous failures experienced in the process of testing new varieties, this is an expensive undertaking which farmers cannot afford, and which must consequently be carried out at experiment stations. Farmers should, therefore, always consult their colleges of agriculture and extension officers before sowing an unknown and unproven variety.

In the past a great diversity of varieties was sown, but the last twenty years have witnessed great progress in the selection and breeding of new varieties which are adapted to local conditions, so that to-day the bulk of the grain crop is produced by only a few varieties.

The aim should be to limit to a minimum the number of varieties sown, the ideal being to sow only one variety. Unfortunately, there is as yet no single variety which will give maximum production under all conditions, so that it is always safer to sow a few good varieties.

Wheat Varieties for the Winter-Rainfall Area.

For the Swartland, Koeberg, Stellenbosch and Caledon-Bredasdorp areas, *Sterling*, *Koalisie* and *Renown* are the obvious principal varieties. The last-mentioned two varieties may sometimes not produce the yields obtained from *Sterling*, but during years when rust is severe, the farmer need never fear a complete crop failure.

In the Swartland and Koeberg areas farmers may, if they prefer, also sow one or more of the following varieties, namely, *Farrartrou*, *Klipkous* and *Beltista*. In the Caledon-Bredasdorp area one or two of the following may be used as supplementary varieties, namely, *Regent*, *Spring Early*, *Caledon Knoppies* and *Izak Rust Knoppies*. The supplementary varieties should, however, always be subordinate to the first three varieties recommended.

For the south-western districts *Koalisie*, *Renown* and *Kenya Governor* are the most suitable varieties.

For the Breë River area where wheat is sometimes sown in small quantities under irrigation and where rust is often severe, one of the following varieties may be chosen: *Koalisie*, *Renown* and *Klipkous*. If a late variety is preferred, either *Regent* or *Hope* may be sown.

Description of Varieties.

Sterling is a medium early variety, which stools well, grows vigorously, and has a reasonably strong straw. It has a dirty-white bearded ear, the glumes of which are covered with fine hairs. In some areas the ear sometimes has a blackish-brown appearance. The grain is large, red, with a wrinkled skin and does not readily shatter. It is fairly resistant to flag smut but susceptible to stem rust. If sown early, it is sometimes subject to *Septoria*. This variety has fairly good baking qualities and falls under Class A.

At present *Sterling* is by far the most popular wheat variety in the winter-rainfall area, accounting for 75 per cent. to 80 per cent. of the wheat grown in this locality. It owes its popularity to the fact that it is very well adapted to this locality, and produces good yields. Although *Sterling* has not been seriously damaged by stem rust during the past few seasons, its greatest defect is its susceptibility to this disease. According to reports received this year, this variety has been seriously damaged by rust in certain localities. Many farmers are therefore making a mistake in sowing *Sterling* exclu-

sively, or almost exclusively, since a severe rust infestation during any particular season may result in the destruction of the entire crop.

Renown is an early wheat, stools well, is a moderately vigorous grower, and has a strong straw. When the plants are in the doughy stage, the straw has a characteristic purple colour. As soon as the wheat is quite ripe, the purple colour becomes less conspicuous. The ear is white with a short tip-beard. The grains are small, red, and do not readily shatter, but the ears are sometimes inclined to break when the wheat is fully mature. *Renown* is fairly susceptible to *Septoria* but highly resistant to both leaf and stem rust. It falls under Class A and possesses excellent baking qualities.

Renown is not equally well adapted to all localities in the winter-rainfall area. In the Caledon-Bredasdorp-Swellendam area it generally produces excellent results. In the Swartland it appears to prefer a definite soil type; here it does better on soils derived from the Malmesbury shales than on sandy soils.

Koalisie is an early wheat, which stools moderately, grows fairly vigorously, and has a straw which is inclined to be weak. It has a short, white bearded ear which shatters fairly readily when quite ripe. *Koalisie* is fairly susceptible to *Septoria* but highly resistant to stem rust. It has poor baking qualities and falls under Class B.

Although *Koalisie* is not grown extensively, it can nevertheless be generally recommended owing to its resistance to rust and drought. It is well adapted to the whole winter-rainfall area and should be grown on a larger scale, particularly in those areas where wheat is often liable to suffer from drought or to be attacked by rust.

Farrartrou, Burbank and Florence. Since these three varieties are very similar in many respects, they are treated together. Their grains cannot be distinguished from one another. In the field, however, *Farrartrou* can be distinguished from the other two varieties by the fact that its straw is firmer and more upright, and its tip-beard is also shorter. *Burbank* and *Florence* cannot be distinguished from each other in any respect.

These varieties are early, stool fairly well, grow fairly vigorously, and have a moderately strong straw. The ears are white with short tip-beards. The grain shatters very readily, and the crop must consequently be harvested in the yellow-ripe stage. The grains are large and white, and have a characteristic large, round germ and a finely crinkled skin.

These three varieties are highly susceptible to *Septoria*, and fairly so to stem rust. They possess excellent baking qualities and fall under Class A.

Nowadays these wheats are grown on a small scale only. Their most valuable quality is their earliness, which enables them to escape rust. Of the three, *Farrartrou* gives the highest yields.

Beltista is early-maturing, grows vigorously, and has only fair stooling ability but a fairly strong straw. The ears are brown, bearded and shatter readily. The grains are red. This variety susceptible to *Septoria* and stem rust. It falls under Class B. *Beltista* cannot be depended upon; in favourable seasons it produces good yields, but during seasons, when drought conditions prevail at the time of ripening, the yields are poor.

Knoppies (*Caledon*) is medium late, has good stooling ability, grows fairly vigorously, and gives a moderately good straw. It consists of a mixture of types. Most of the ears are brown, short, compact and bearded. Some plants, however, have white bearded ears

while others have brown and white tip-bearded ears. The grains are small with the base incurved, and of mixed colours—red and white.

This variety is fairly resistant to stem rust, and is cultivated on a small scale in the Caledon-Bredasdorp area. It cannot be generally recommended.

Knoppies (*Izak Rust*) is late-maturing, stools well, grows moderately, and has a reasonably strong straw. The ears are white, short, compact and bearded. The grains are red and do not shatter readily. The variety is reasonably resistant to rust, but fairly susceptible to *Septoria*. It has moderate baking qualities and falls under Class B.

Although fairly resistant to drought, this variety, being late-maturing, can be grown in low-rainfall areas, with a certain measure of success, only if seasonal conditions permit of early sowing.

Klipkous is early, stools moderately, grows vigorously, and has a straw which is sometimes inclined to lodge. The ears are white and entirely beardless. This variety consists of a mixture of two types; one having a tapering ear with glumes which adhere very closely, and the other a straight ear with looser glumes. The grains are white and do not readily shatter. *Klipkous* is susceptible to *Septoria*, and is moderately resistant to stem rust. It has excellent baking qualities but being a mixture falls under Class B.

Klipkous was made available to farmers only a few years ago, and is not yet being grown on an extensive scale. In some areas it is very popular with farmers, but less so in others. This variety does not produce such good yields as some of the popular varieties, and it is doubtful whether it will ever be grown on any considerable scale.

Regent matures late, stools very well, grows vigorously, and is strong-strawed. It has a long, white ear with a short tip-beard. The grains are brown and do not readily shatter. This wheat is highly resistant to stem rust. It possesses good baking qualities, and falls under Class A.

This variety is too late for the greater part of the winter-rainfall area. In the Caledon-Bredasdorp area it produces good yields, if sown early.

Spring Early is medium late, stools well, grows fairly vigorously, and has a moderately strong straw. The ears are brown and bearded. The grains are light-red, and do not readily shatter. This variety is susceptible to stem rust. It has poor baking qualities and falls under Class B.

Spring Early is grown only on a small scale in the Caledon-Bredasdorp area, where it gives reasonable results during some years. It is unsuitable for the rest of the winter-rainfall area.

Kenya Governor is very early, stools poorly, grows fairly vigorously, and has a weak straw. The ears are brown with long tip-beards. The grains are white and shatter readily. This variety is highly susceptible to *Septoria* and stem rust. It has reasonably good baking qualities, and falls under Class B.

This variety does reasonably well in the south-western districts, but in other areas the results are poor.

Wheat Varieties for the Summer-Rainfall Area.

In the summer-rainfall area wheat is sown under dry-land conditions and also under irrigation, so that it is essential to make separate recommendations in respect of suitable varieties.

In the Transvaal most of the wheat produced is grown under irrigation, and the varieties recommended vary from area to area. Early varieties are best suited to the Marico, Rustenburg, Brits and Pretoria districts, i.e., the western Bushveld, and *Lalkasarwali*, *Rooikleinkoring* and *Wolkoppie* are recommended. In the eastern Bushveld area, i.e., Pretoria, Bronkhorstspruit, Witbank, Middelburg and Lydenburg, the varieties *Lalkasarwali* and *Rooikleinkoring* also do well, but in the more easternly areas, where rust is severe, *Kruger* and ,to a lesser extent, *Sterling* are safer choices. Where irrigation water is conducted from fountains and streams which flow intermittently, *Scheepers* (*Baart Indië*) or *Kaal Indië* should preferably be sown.

In the irrigation area of the western Transvaal (Krugersdorp, Ventersdorp and Potchefstroom), *Duimpies* (*Knoppies*), *Scheepers* and *Red Egyptian* yield the best results, if sown early, while *Lalkasarwali* is the best of the earlier varieties.

In the northern Transvaal no variety can tolerate the forcing heat of spring better than *Lalkasarwali*, which is therefore generally recommended, except for those areas where rust is severe and where it would consequently be better to sow *Kruger*.

During the past few years a considerable quantity of wheat has also been grown under dry-land conditions in the Transvaal, especially on the Springbok Flats and the highveld. In the highveld districts of Bethal, southern Middelburg and Standerton, *Scheepers* apparently gives the best results.

The dry-land cultivation of wheat on the Springbok Flats is a new development, and must be ascribed to the occurrence of exceptional rains during autumn and winter, as well as to the absence of killing frosts during the past few seasons. Although the soils show a high water-retention capacity, it is doubtful whether this area will be able to maintain a stable dry-land wheat production in normal years. *Lalkasarwali* appears to give the best results.

In the *Free State* wheat is grown almost exclusively under dry-land conditions, but both the area planted and the quantity produced are subject to wide fluctuations, and the undertaking is becoming increasingly precarious as it is extended to the west. At present wheat production may be regarded as established in an area east of an arbitrary line running through Heilbron, Winburg, Verkeerdevlei, Dewetsdorp and Rouxville. In this area *Scheepers* is by far the most important variety, although *Red Egyptian* and *Spring Early* are sown to a lesser extent.

Cape Province. The principal wheat producing locality in the summer-rainfall area of the Cape Province is the north-eastern Cape where wheat is grown mainly under dry-land conditions. In the Aliwal North, Burghersdorp, Molteno, Jamestown and Lady Grey districts of this area the most popular variety is *Rooi Stormberg* which is really a mixture of *Red Egyptian*, *Scheepers* and *Duimpies*, and it is recommended that the pure form of any one or more of these varieties should rather be cultivated. For late sowing *Spring Early* is the best variety, and is the principal wheat grown in Dordrecht, Queenstown, and the western part of Indwe. In this area *Red Egyptian* is the second choice. For the eastern part of Indwe and for the districts of Elliot, Ugie and Maclear, *Gluretty* is recommended. In the whole of the north-eastern Cape Province *Maine's Patent* and *Sterling* are grown on a lesser scale, but apparently do well enough to merit general recommendation.

In the Great Karroo wheat is grown to a limited extent under irrigation, the principal varieties being *Red Egyptian* or *Knoppies* (*Duimpies*) and *Oubaard*. In the Little Karroo, and especially in the vicinity of Oudtshoorn where wheat is also grown under irrigation, *Kruger* always used to be the most popular variety owing to its resistance to rust, but lately it has to a large extent been supplanted by *Improved Kenya*, while *Kenya Governor* is also cultivated. The last-mentioned two varieties appear to be well adapted to the Port Elizabeth coastal area extending as far as the Zuurberg.

A considerable quantity of wheat is grown under irrigation along the Orange River, and although *Wolkoring* and mixtures containing *Wolkoring* continue to be cultivated, *Lalkasarwali* does better in this area, and can therefore be recommended in preference to the former.

Sufficient information is not yet available to justify a definite recommendation of suitable varieties for the Vaalhartz Settlement. Up to the present early varieties like *Rooikleinkoring* and *Lalkasarwali* have been cultivated with a varying degree of success, but it is by no means impossible that a late variety like *Duimpies* will in course of time be sown predominantly.

Description of Varieties.

Lalkasarwali is an early, bearded wheat, which stools well and grows vigorously, but has a rather weak straw. It is susceptible to rust, but early enough to escape severe infestations, if sown in good time. *Lalkasarwali* has reasonably good baking qualities and falls under Class B. It can be regarded as the most important early variety grown under irrigation in the summer-rainfall area.

Rooikleinkoring is an early, bearded variety with a weak straw, but stools well and grows vigorously in fertile soils. It is highly susceptible to rust, and does not produce good yields on exhausted soils. *Rooikleinkoring* has very good baking qualities and falls under Class A.

This variety has probably been cultivated under irrigation for longer than any other variety, but owing to its susceptibility to rust and its poor performance on exhausted soils, it is becoming less popular.

Wolkoppie (or Witkleinkoring) is an early, bearded wheat with a weak straw, has good stooling ability, and grows vigorously even under rather poor soil conditions. It is susceptible to rust, has poor baking qualities and falls under Class B.

Wolkoppie has increased in popularity, especially on the poorer irrigation soils.

Kruger is a very early variety, with a tip-beard and stiff glumes which make it less liable to be attacked by birds. It has poor stooling ability, and also produces poor yields, but is resistant to rust, has good baking qualities and falls under Class A. In the summer-rainfall area *Kruger* is practically the only variety which can be successfully grown where rust infestation is severe, but is unpopular owing to its low yield capacity.

Scheepers is a late, bearded wheat which stools well, and grows vigorously; it is resistant to drought, but has a weak straw. *Scheepers* is susceptible to rust, but is otherwise by far the best and most popular dry-land wheat for the Free State and Transvaal high-veld. It has good baking qualities, and falls under Class B. *Scheepers* is an excellent wheat for pasturage.

Red Egyptian is a late, bearded wheat with a strong straw, stools well, and grows vigorously. It is susceptible to rust but does comparatively well under unfavourable conditions. It has good baking qualities, and falls under Class A, but usually has a low bushel weight and for this reason is seldom classed in the highest grades. *Red Egyptian* can tolerate severe winter conditions, does well in poor soils, and is excellent for pasturage.

Duimpies (*Knoppies*) is a late, bearded variety with a compact ear, and its growth habit closely resembles that of *Red Egyptian*. It is susceptible to rust, but does well on poor irrigation soils in the colder areas. The baking qualities of *Duimpies* are not as good as those of *Red Egyptian*. It falls under Class B.

Gluretty is a medium late, hardy wheat with a strong straw; it stools reasonably well, and grows vigorously. This variety is susceptible to rust and its baking quality is such that it falls under Class B.

Improved Kenya is very early, stools moderately well, grows fairly vigorously, and has a medium strong straw. The ears are light-brown with a long tip-beard. The grains are white and shatter readily. This variety is susceptible to *Septoria* and stem rust. It falls under Class B, and should not be confused with *Kenya Governor*.

Spring Early and *Kenya Governor* are described under wheat varieties for the winter-rainfall areas.

Oat Varieties Recommended.

As in the case of wheat, oat varieties also differ in regard to their adaptability, and the same varieties cannot be recommended for all areas. For the Swartland and Koeberg, *Langgewens* and *Boone* are the best varieties. During years when leaf-rust is particularly severe *Boone* will out-yield *Langgewens*. In drier areas like Piquetberg, *Mulga* may also be sown. For the higher-rainfall districts like Stellenbosch, the varieties *Jongensklip*, *Boone* and *Langgewens* are recommended, and for the Caledon-Bredasdorp area and the south-western districts, *Boone* and *Jongensklip*.

In the summer-rainfall areas where oats are grown primarily for pasturage under dry-land conditions, *Algerian* is by far the most important variety. *Winter Dunn* is grown to a limited extent but, all things considered, it is doubtful whether its preference to *Algerian* can be justified. It is improbable that the latter variety will be ousted by other varieties, as happened in the Western Province, since climatic conditions demand a late variety which will shoot up only after the arrival of the first summer rains.

Where oats are grown under irrigation, however, *Langgewens* is recommended, and in areas where rust is severe, as for example in the most easterly parts of the Transvaal and in Natal, *Boone* is a good choice and preferable to *Sunrise*.

Description of Varieties.

In contrast to wheat, only a few oat varieties are grown, the following being the most important:

Langgewens is medium early, stools well, grows vigorously, and yields a moderately strong, fairly coarse straw. The grains are brown, and have weak awns on both the first and second grains. The seed is inclined to shatter. This variety is susceptible to both leaf and stem rust, and falls under Class A.

Langgewens is a very popular oat variety, especially in the Swartland where it is seldom out-yielded by any other variety. In

the Caledon-Bredasdorp area and in the south-western districts, however, it is seldom sown, mainly owing to its susceptibility to rust. It is well adapted to the summer-rainfall area, and produces high yields under irrigation.

Jongensklip is a medium early variety, which has good stooling ability, grows vigorously, and develops a fairly strong and medium fine straw. The grains are brown and have weak awns on both the first and second grains. The grains of *Jongensklip* and *Algerian* are indistinguishable from each other, and cannot always be distinguished with any degree of certainty from those of *Langgewens*, especially when the latter happen to be lean. Normally, however, the grains of *Langgewens* are broader, shorter and plumper.

Jongensklip is susceptible to both leaf and stem rust, and falls under Class A.

It is an early selection from *Algerian* and in areas with a high rainfall such as Stellenbosch, and also in the Caledon-Bredasdorp area and the south-western districts, it does better than *Langgewens*, but during years when rust is severe, it is seriously damaged in these areas as well. *Jongensklip* cannot be recommended for the summer-rainfall area.

Algerian is a late variety, which stools well, grows vigorously, and has a fairly strong and medium fine straw. The grains are brown and have weak awns on both the first and second grains, which resemble those of *Jongensklip* in all respects. This variety is susceptible to leaf and stem rust, and falls under Class A.

From 1900 to 1930 *Algerian* was the most popular oat variety in the winter-rainfall area. Since then, however, it has been almost entirely superseded by *Langgewens* and *Jongensklip*. As a result of this development, Transvaal and Free State farmers who used to obtain all their Algerian oat-seed requirements from the Western Province now experience great difficulty in obtaining pure seed of this variety. In view of this state of affairs they should take more trouble to ensure the production of an adequate supply of locally-grown *Algerian* seed.

Other strains of *Algerian* such as *Red Rust Proof*, *Texas*, *Smyrna*, *River Plate*, *Sidonian*, *Appler* and *Bancroft*, which were very popular 25 years ago, have completely disappeared from the scene.

Boone is medium early, stools well, grows vigorously, and has a strong, medium fine straw. The grains have a yellowish-white colour, are small, and both the first and second grains are generally awnless. This variety is somewhat susceptible to stem rust but is wholly resistant to the present form of leaf rust. It falls under Class B.

This oat variety was distributed among farmers a few years ago. In general, it is well adapted to the whole winter-rainfall area. In those parts where leaf rust is troublesome, it is an excellent variety to sow. According to observations, it would appear that *Boone* is more resistant to stem rust than any of the other varieties already mentioned. It is not so resistant, however, that it will safeguard the farmer against a crop failure during years when stem-rust infestation is severe, but can nevertheless be recommended for the whole winter-rainfall area. In the summer-rainfall area *Boone* is still comparatively unknown, but appears to be well suited to this area as well.

Sunrise is early-maturing, has poor stooling ability, grows vigorously and has a weak, coarse straw. The grains are large and white, and have strongly developed black awns, which usually break

off during the threshing process—only on the first grains. It is susceptible to stem and leaf rust, and falls under Class B.

Sunrise is a very popular variety for grazing purposes. It is very palatable, and is readily eaten by stock. In so far as the grain yield is concerned, this variety usually falls short of the varieties dealt with above, and consequently cannot be recommended when grain production is the principal aim.

Mulga is early, stools moderately well, grows fairly vigorously, and has a medium fine straw which is inclined to be weak. The grains are a dirty white with strong black awns on the first grains only. It differs from *Sunrise* in that the grains are considerably smaller. Moreover, this variety is seldom quite pure; samples always contain a small percentage of brown grains and occasionally also a few black grains. It falls under Class B. The most outstanding quality of *Mulga* is its earliness. It can be recommended only for dry areas such as Piquetberg.

Barley Varieties Recommended.

In the Worcester-Robertson-Montagu-Ladismith area where the bulk of the malt barley produced is grown, and also in the Lydenburg and Louis Trichardt districts, the best varieties to sow are Elses and Cape Six-Row, although improved varieties may become available in the future. Since mixtures of two-row and six-row types are unsuitable for brewing purposes, farmers in these areas are advised to confine themselves to the production of the two above-mentioned six-row types which are very well adapted to these areas.

Two-row types also do well in these areas, but their cultivation cannot be recommended since this might result in the mixing of the two types. Another important area for the production of brewers' barley is along the Olifants River (Van Rhynsdorp district). *Swanneck* is best suited to this locality. This variety not only produces high yields, but usually also has a very good colour. For the same reasons given above, farmers in this area are advised to grow only one type, namely, the two-row type and not the six-row types.

Early Cape is not recommended for grain production. It should be grown only for soiling purposes, but even in this respect it is excelled by the hooded type of barley-wheat (naked barley) since the latter is free from undesirable awns.

Wheat farmers who grow barley as a concentrate feed, are advised to sow either *Cape Six-Row* or *Elses*. In most cases the barley is fed to stock without being rolled or crushed, with the result that the whole grains often pass through an animal, and when the manure is deposited on the lands, they subsequently give rise to volunteer plants in the wheat. In threshing, it is comparatively easy to separate six-row barley from wheat, but extremely difficult to do so in the case of two-row barley. Consequently, the latter is bagged with the wheat and its presence results in the grade and market value of the wheat being reduced.

Description of Varieties.

Cape Six-Row is late, stools well, grows vigorously, and has a medium strong straw. It is a hulled, bearded six-row type with greenish-white grains, and falls under Class A.

This variety is also known as *Ougars*, *Smyrna* and *Laatgars*; it is very popular for brewing purposes and produces high grain yields.

Elses is medium late, stools well, grows vigorously, and has a strong straw. It is a hulled, bearded six-row type with greenish-

white grains which are indistinguishable from those of *Cape Six-Row;* it falls under Class A.

Elses is a selection from *Cape Six-Row*, and reaches maturity from 8 to 10 days earlier. It also has a strong straw and is more resistant than the latter to *Rhyncosporium* leaf spot. It produces the same grain yields, and is equally suitable for brewing purposes.

Early Cape is a very early variety, which stools moderately well, grows vigorously and has a medium strong straw. It is a hulled six-row type with greenish-white grains which are generally smaller than those of the first-mentioned two varieties. It falls under Class A.

Owing to its earliness *Early Cape* is particularly suitable for soiling purposes, but produces poor grain yields and cannot compare with *Cape Six-Row* or *Elses* in this respect.

Swanneck is fairly early, stools well, grows fairly vigorously, and has a medium strong straw. It is a hulled, bearded two-row type. The grains are comparatively short and broad, and light straw-coloured.

Swanneck falls under Class B, produces good grain yields and is suitable for brewing purposes.

Barley-wheat (naked or hull-less barley).—The barley varieties known by this name consist of two types; one is bearded, while in the other the place of the beard is taken by a hood. The latter type is commonly known among farmers as barley-wheat. In both types the grains separate from the glumes in the threshing process, as in the case of wheat. Hence the name barley-wheat.

Barley-wheat is early maturing, grows vigorously, stools well and has a fairly strong straw. The colour of the grain varies in the different types, and may be white, blue, bluish-green or purple. It falls under Class D.

Since barley-wheat is early-maturing and produces large yields of green material, it is very popular as a green feed. The grain yield, however, is comparatively poor, and since the glumes separate from the grains during the threshing process, it is unsuitable for brewing purposes.

Rye Varieties.

In the winter-rainfall area the only variety cultivated is *Early Cape* which grows well, even under difficult conditions. It is resistant to drought, and produces good yields even on poor soils. The grains are mostly of a bluish-green colour.

Several newly-bred varieties are already being tested with good results on farms in the Sandveld, but are not yet being grown on an extensive scale.

In the summer-rainfall area rye is sown almost exclusively for pasturage, and, although oats and wheat enjoy greater popularity in this respect, rye can be cultivated with equal success. Rye should preferably be sown on the sandier and more acid soil types of the eastern Transvaal where, owing to its resistance to rust, it will not only be better adapted, but also a safer crop.

Groundnut, Lucerne and Teff Seed.

J. Sellschop, Professional Officer, College of Agriculture, Potchefstroom.

Groundnut Seed.

THE small 1942 groundnut crop was purchased by the Controller of Food Supplies in order to safeguard the seed position for the 1942-43 season. This undertaking achieved its aim and increased plantings were made in the leading groundnut producing areas. Seed is generally obtainable from the co-operative society handling the bulk of this crop as well as from seedsmen and individual growers advertising in the agricultural press.

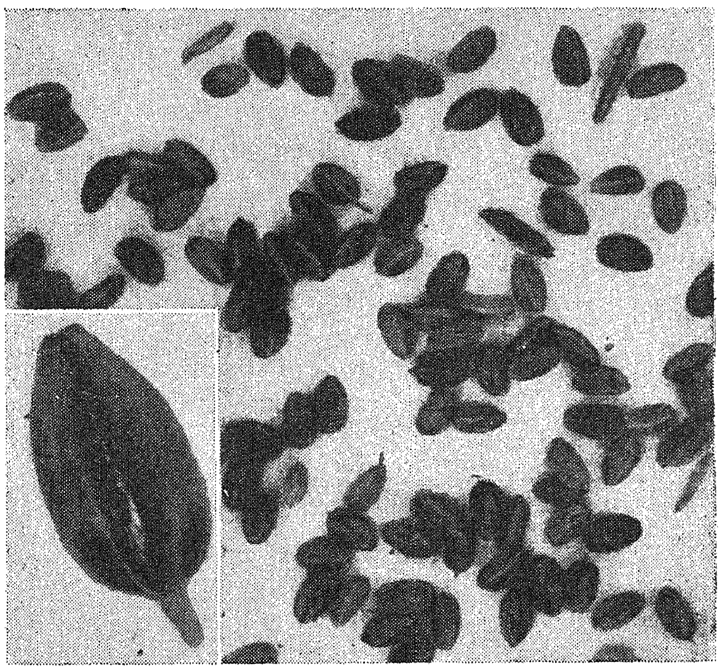


FIG. 1.—Seed of watergrass or "uintjies" enlarged 4 diameters, and (inset) 25 diameters. The seeds are triangular in cross section with three marked longitudinal ridges.

[*Photo: Dr. A. R. Saunders.*

No other crop presents such difficulties with germination of the seed and the securing of good stands as groundnuts. Wastage of seed can be avoided if it is stored, shelled or unshelled, in a cool place away from corrugated iron walls, treated with a suitable seed protectant*, and planted in moist earth after about an inch of rain has fallen. Fields planted on the expectation of rain are often a failure. Closely planted stands are essential for good yields. Observations show that plants standing far apart are generally far more subject to Rosette disease than closely planted ones.

During the past two seasons the Natal Common, a two-kernelled variety, has been introduced in many areas. Whether it will become

* See article on the Disinfection and Protection of Seed.

as popular as the Virginia Bunch variety depends on the extent to which it can be readily picked and shelled with the facilities available. It produces more hay than the Virginia Bunch but there is no proof as yet that it is more resistant to nut-rot*. On the Natal coast and the eastern lowveld cf the Transvaal the Natal Common variety has been found to be more suitable than the Virginia Bunch, particularly on account of its greater resistance to bacterial wilt† in these areas.

Lucerne Seed.

In order to conserve the supply cf lucerne seed after two poor crop years, exports of this commodity have been under control since 1942. Considering the price of hay, which has some influence on the amount of lucerne seed produced, and the not too favourable climatic conditions of the current season, it would appear that no exportable surplus will be available this year.

The lucerne seed expcrted in the past was generally of a high standard, while that sold in the Union as export quality seed often did not comply with the requirements laid down for the former. As lucerne seed has been declared as seed in terms of the Fertilizers, Farm Foods, Seeds and Pest Remedies Act, it is now necessary that the degree of purity and germinaticn capacity of all lucerne seed be given on the containers. Seed having a purity of 99 per cent. and a germination capacity of 90 per cent. may be labelled as standard seed. There is evidence that as the result of this measure greater care is being taken with the cleaning of lucerne seed and the weeding of fields intended for the harvesting of seed. Certain weed seeds are most difficult to eliminate from lucerne seed even though the most efficient machines may be used. The plants producing them should be removed from fields intended for seed production. Lucerne seed cleaners would do well constantly to urge seed producers to grow clean crops for seed.

The most popular varieties of lucerne are Provence and Hunter River and some interest ccntinues to be shown in the Chinese variety. Since cross pollination does take place in lucerne, growers of seed should take reasonable precautions to see that fields intended for seed are sufficiently isolated. There is no satisfactcry methods of distinguishing between the seed of the varieties mentioned.

Teff Seed.

Teff seed used to be one of the purest of the seeds sold in the Union, but during recent years it has become one of the most dangerous on account of the large amounts of weed seeds with which it is often contaminated. An examination of numercus samples of seed collected throughout the teff producing areas shows that relatively few areas produce teff seed free from nut gras‡ ("Uintjie") seed. Commercial supplies have been found to contain over 20 per cent. of it (see Fig. 1).

As nut-grass seed does not germinate until it has aged considerably, infestations brought through seed are, therefore, often not noticed until two or three years after the production of a teff crop from contaminated seed. The silver coloured, three cornered nut grass seed can be screened off only with the greatest difficulty, and then not entirely, as it is not much larger than teff seed. Seed adver-

* *Sclerotium Rolfsii.*
† *Bacillus Solanacearum.*
‡ *Cyperus spp.*

tised as double and treble screened has been found to contain even more nut-grass seed than some samples of unscreened seed. Unless steps are taken to control the seeding of nut grass, such as cutting the teff at least once before it is allowed to seed, fields infested with this troublesome weed should not be used for seed production.

Tests are being carried out with a view to proclaiming teff seed as seed under the Fertilizers, Farm Foods, Seeds and Pest Remedies Act in the near future. Unless reasonably clean seed is produced,

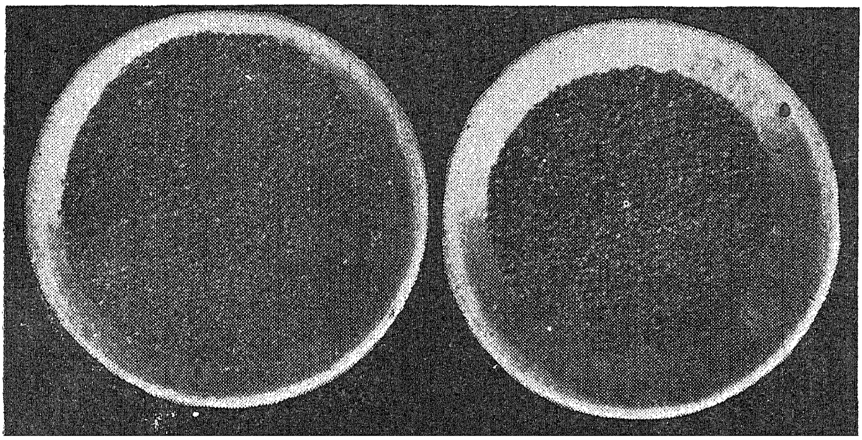


FIG. 2.—Impurities in teff seed. The seed on the right, consisting almost entirely of "steenboksuring" and "uintjies" was sifted out from the sample of teff on the left.

[*Photo: Dr. A. R. Saunders.*

it will be necessary to indicate the percentage of impurities in seed offered fcr sale.

As a result of the high prices charged for seed, fields considered unsuitable for the production of seed on account of the presence of sheep sorrel* ("Steenboksuring") have been allowed to produce teff seed during the past two years. This has been the case especially in parts of Natal. Samples of teff submitted for examination have been found to contain up to 32 per cent. of sheep sorrel seed (see Fig. 2), which, though it can be screened from teff more satisfactorily than nut-grass seed, constitutes as great a menace to uninfested areas.

Both nut-grass and sheep sorrel seed threaten to become very serious pests of cultivated fields. Their seeds cannot be kept out of teff and other seed as long as infested seed is sown on clean land, or clean seed is sown on infested fields. Furthermore, a teff crop cannot be expected to suppress nut-grass or sheep sorrel cn poor worn-out soil. The fertility of the soil is therefore an important consideration in teff seed producticn.

The Agricultural Research Institute†, Pretoria, in co-operation with other experiment stations, is testing selections of both white and brown seeded teff grass. It is probable that one or more of these selections will, in time, replace common teff in certain districts.

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* *Rumex acetosella.*

† Information kindly supplied by Dr. D. J. Haylett.

Efforts to Supply Sound Seed Potatoes.

L. J. Henning, Senior Professional Officer, Division of Animal and Crop Production.

EVERY year South Africa must import large quantities of seed potatoes to replace degenerated tubers. This degeneration is caused by virus diseases which are transmitted from plant to plant mainly by insects. These virus-carrying insects are of fairly widespread occurrence in most of the established potato-producing areas of the Union. Infection and the resultant degeneration consequently take place so rapidly, that potatoes are rendered unsuitable for planting purposes within three or four years. In cooler countries like Scotland, Ireland, and the northern part of North America, potatoes are subject to a much smaller number of virus diseases, and for that reason sound, vigorous seed potatoes are generally imported from these countries. Despite the favourable conditions for the production of seed potatoes, everything possible is done even in those countries to safeguard potatoes against infection by virus diseases, and to certify seed potatoes according to the percentage of infected plants occurring on the lands. All imported seed potatoes are, therefore, not equally sound.

Precautionary Measures by the Department.

When importation was restricted by the very limited shipping space and local supplies were in danger of becoming exhausted owing to the increased war-time demand for potatoes, the Department of Agriculture and Forestry made strenuous efforts to maintain potato production at the highest possible level by making more healthy seed potatoes available. As a first step the number of seed-potato associations was increased from three to twenty-eight. The potato lands of members of these associations are inspected twice, and where the plants and tubers conform to certain health requirements, the tubers are given an "A" certificate. As a temporary measure, seed potatoes from lands on which more than 5 per cent., but not more than 10 per cent. of virus-infected plants occur, are given a "B" certificate. Similarly, the lands of individuals not belonging to these associations are also inspected, and where the plants conform to the requirements of the "A" certificate, the Scheme II label is issued. Through these inspections about 105,000 bags of seed potatoes were certified during 1942 as suitable for planting purposes. During 1943 the number was 135,000 bags. As a result of the improved conditions, Scheme II was abolished and certification was confined to potatoes cultivated by the members of seed-potato associations. (The names and addresses of the existing associations are given at the end of this article.)

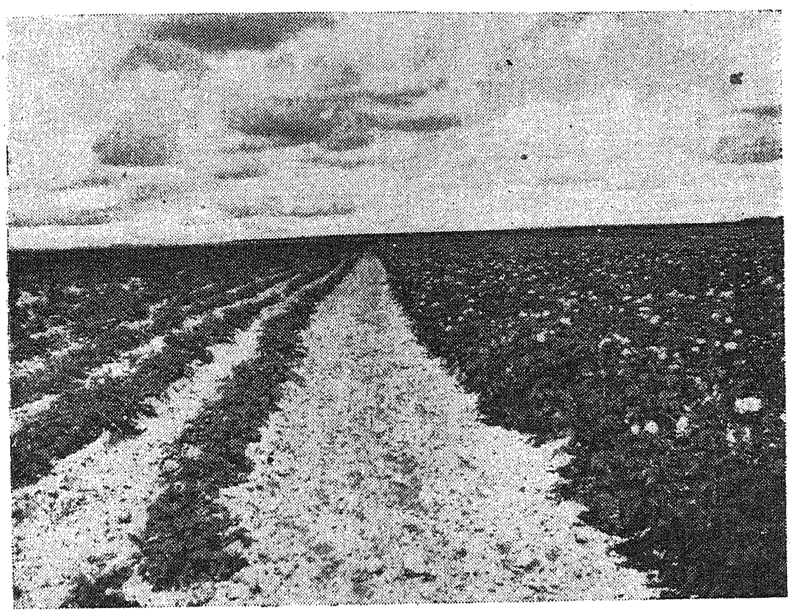
A second measure was to ensure that importation took place as effectively as possible, and to arrange that in respect of the date of arrival, each consignment would be planted in the most suitable area. This step was necessary because regular importers of seed potatoes were not prepared to accept the risks attached to importation since there are no insurance facilities to cover rotting due to delay.

State Plantings for Seed-potato Production.

At State expense and risk, the Food Control Organization imported 28,000 boxes of 100 lb. each during 1942 and 16,600 in 1943. The basis on which allocations of the imported tubers were made, was laid down by the Food Control Organization, while their distribution was undertaken by the regular importers. During both years preference

was given to seed-potato associations, so that multiplication could take place as far as possible through controlled bodies.

The co-operation of the Department of Lands was enlisted to multiply 4,000 boxes of seed potatoes on the Vaal-Hartz and Riet-river settlements. Although the lands were planted with imported tubers, they were carefully examined and all plants infected with virus disease were removed. Under the favourable irrigation conditions, the highest possible multiplication could be obtained and, consequently, 20,000 bags of first-from-imported seed potatoes were sold



Good *versus* bad potato seed, planted at the same time and under identical conditions.

To the right: First from imported, vigorous seed.

To the left: Fourth from imported and badly degenerated seed.

mainly to producers of table potatoes on the Transvaal highveld and in the Orange Free State. Tubers grown on the two irrigation settlements produced extremely satisfactory yields in nearly all cases.

Approximately 4,000 boxes which arrived too late for planting in other areas, were planted under irrigation in the lowveld at Pongolo Settlement, but owing to early frost, considerable damage was done, and all the orders could not be carried out.

Research Work on Degeneration Diseases.

In order to promote the production of seed potatoes, research work was carried out in various directions with a view to counteract the rapid degeneration of potatoes, and undertake the production in this country of seed potatoes which are absolutely free from virus diseases. The rate of degeneration in potatoes is largely dependent on the number of virus-carrying insects to which they are exposed. For this reason a survey is being made of the numbers of potato virus-carrying insects which occur in the various areas in order to determine where the most suitable seed-production areas are situated. Up to the present it has been found that on the Transvaal highveld potato plants usually carry an exceptionally large number of plant lice

(aphides) e.g., *Myzus persicae*, while only small numbers occur in the Vaal-Hartz and Riet River areas. It is presumed that the latter areas are too dry and too hot for the insects to develop in great numbers, whereas in Scotland development is arrested through too high humidity and too low temperatures.

In its efforts to obtain potatoes which carry no virus diseases at all the Division of Botany and Plant Pathology examined large numbers of tubers and was fortunate enough to discover a few which were completely free from any of the known viruses. This small quantity of clean tubers was carefully multiplied with a view to further multiplication on the Riet River Settlement. Since this settlement lies in an isolated hot, dry area where plant lice and virus-carrying insects do not occur in larger number than in Scotland, the chances are very good that the clean tubers will remain healthy for an appreciable period. As a source of vigorous seed potatoes, this undertaking deserves considerable interest. If it proves a success the Union need no longer be completely dependent on supplies of imported seed potatoes. If it does not succeed, very little will have been lost by making this experiment.

An investigation is also in progress in connection with the control of eelworm, the storage of seed potatoes and the testing of new potato varieties.

Hints to Potato Farmers.

Potato growers can do much themselves, however, to maintain the vigour of seed potatoes for a longer period by following the hints given below:—

(1) Import only the best certified seed potatoes. (2) Do not plant healthy seed potatoes in the vicinity of lands on which badly degenerated plants occur. (3) Follow a system of crop rotation which will help to control eelworm. (4) Cut large tubers, if necessary, so that large, healthy tubers can be used for planting instead of for the table. (5) Keep potato lands free from weeds since "stinkblaar" (*Datura*), Cape gooseberry and certain other weeds also harbour the virus diseases which infect potatoes. (6) A large multiplication of healthy seed potatoes cannot be expected unless the soil is well cultivated and thoroughly fertilized.

Names and Postal Addresses of Seed-potato Associations.

CAPE PROVINCE.

Name.	*Address.*
Birkly East	P.O. New England.
Dordrecht	P.O. Dordrecht.
Elliot	P.O. Elliot.
Friesland	P.O. Ceres.
Hansmoeskraal	P.O. George.
Kruis River	P.O. Ceres.
Outeniqua	P.O. Great Brak River.
Prince Alfred Hamlet	P.O. Prince Alfred Hamlet.
Villiersdorp	P.O. Box 6, Villiersdorp.
Ugie	P.O. Ugie.
Witzenberg	P.O. Box 55, Ceres.
Worcester	P.O. De Wet Station.

NATAL PROVINCE.

Name.	*Address.*
Underberg	P.O. Underberg.
Boston	P.O. Elandskop.
Donnybrook	P.O. Donnybrook.
Blood River	P.O. Strathcona.
Mooi River	P.O. Rosetta.

ORANGE FREE STATE

Bethlehem	P.O. Box 128, Bethlehem.
Frankfort	P.O. Frankfort.
Westminster	P.O. Westminster.

TRANSVAAL PROVINCE.

Ermelo	P.O. Box 16, Ermelo.
Geduld	P.O. Hartebeesfontein.
Haenertsburg	P.O. Haenertsburg.
Klerksdorp	P.O. Box 156, Klerksdorp.
Werda	P.O. Oorbietjiesfontein.
Woodbush Mountain	P.O. Houtboschdorp.

Oat-variety Trials.

F. X. Laubscher. Research Officer, College of Agriculture, Potchefstroom.

A VARIETY trial with oats at Potchefstroom was first laid down in 1904,(1) when British and Scotch varieties were tested against Algerian which was imported into the Cape subsequent to the failure of Boer oats during the rust epidemic of 1898.(2) In this trial the British and Scotch varieties gave higher hay yields as compared to Algerian but the latter was a better grain yielder. Simultaneously a few of the oat varieties then cultivated in the Cape were compared in another trial. This second test also confirmed the superiority of the Algerian types as against the old Boer oats for Transvaal conditions.

In 1910 imported as well as local strains of Algerian were tested against Boer oats. The three Algerian types had more or less the same yield and were all better than Boer.

In 1912 after many of the Algerian types had been isolated and become known in the seed trade as separate varieties, they were compared with Burt which had been imported the previous year from the United States by the firm C. Starke & Co., of Mowbray, Cape.(2) The Algerian group consisted of Algerian, Texas, Smyrna, Appler and Bancroft. The latter did show some difference between them and Bancroft was particularly poor, but taken as a whole they were better than the earlier Burt variety.

Algerian oats had by then apparently acquired general recognition through satisfactory performance, and there was no evident need for further oat variety trials until 1926 when a new type, Kanota, was introduced from Kansas, U.S.A. Kanota was tested against Algerian for three consecutive seasons and although it was satisfactory in both hay and grain yields, it proved to be inferior for grazing purposes as well as susceptible to rust. All oat-variety trials at Potchefstroom were suspended in 1928.

New Oat Varieties.

Due to the issue by the Stellenbosch-Elsenburg College of Agriculture of two new varieties, "Jongensklip" and "Langgewens", in 1932 and their rising popularity, farmers in the summer rainfall area gradually began to make more enquiries concerning these two varieties.

An important portion of the oat crop of the summer rainfall area is grown under dryland conditions and is intended for grazing to a smaller or larger extent, but facilities do not exist for the satisfactory testing of new varieties in this respect. In the case of irrigation farming there is, however, also a need for suitable varieties particularly since many of the old wheat lands show heavy infections of rootrot diseases and oats actually offer the only alternative of a resistant winter rotation crop. An oat variety trial was thus begun again in 1943 and the results obtained are given in the table below.

The layout of this experiment was such that a comparison could be made between different designs and although this aspect is of little importance for the ordinary farmer the results so obtained with the different designs are given for the technical value they may have. Differences between varieties are best given in the last four columns.

Yields of Oat Grain in Bags (150 lb.) and of Hay in Tons per morgen under Irrigation.

	With Five Replications.		With Four Replications.			
Design:	Latin Square.		Incomplete Blocks.			
Variety.	Grain.	Hay.	Grain.		Hay.	
	In Bags.	In Tons.	In Bags.	In Per cent.	In Tons.	In Per cent.
Langgewens	34·33	6·21	35·81	131·7	6·44	121·5
Sunrise	23·88	5·46	22·72	83·5	5·40	102·0
Burt	20·51	4·47	19·79	72·8	4·37	82·4
Boone	29·76	5·31	31·36	115·3	5·39	101·7
Jongensklip	26·79	5·01	26·29	96·7	4·89	92·4
Mean	27·05	5·29	27·19	100·0	5·30	100·0
Significant Difference (P — ·05)	4·94	0·89	4·27	15·7	0·46	8·6
Variance Ratio (V)	11·0	4·9	22·3		27·5	
V requirements (P — ·05)	3·26		3·36			

Discussion of Results.

According to the results of the more efficient incomplete block design the grain yield of Langgewens is significantly the highest, while Boone is better than the other three varieties. Jongensklip is probably superior to Sunrise and has significantly outyielded Burt. The difference in yield between Sunrise and Burt is not significant.

As hay types Langgewens outyielded all the other varieties, while Sunrise and Boone, with no difference of significance between them, gave higher yields than Jongensklip and Burt. The latter had the lowest hay yield.

Burt is the earliest oat of the five under test and the growing period of the others increases in the order: Sunrise, Langgewens, Jongensklip and Boone. Regarding fineness of straw and hay quality the order of merit is Burt, Boone, Jongensklip, Langgewens and Sunrise. In the tobacco growing bushveld areas where the winter crop must be off the land as soon as possible, Burt fits in very well. Otherwise it is evident that Langgewens as a medium early variety is eminently suitable under irrigation in the Transvaal. Before definite recommendations can be made, however, it would be advisable to test the varieties concerned for a number of years, but even at this early stage it is clear that Langgewens will thrive here just as well as in the western Cape Province. Jongensklip appears to be less promising in this respect.

Boone is a new variety from the United States of America and was obtained from a cross between the South American variety Victoria and Richland, and American selection out of the Russian variety Kherson.(3) Boone is reported to be resistant to practically all the races of stemrust, crownrust and smut occurring in the U.S.A. If it proves to be as disease resistant in this country, it will no doubt find a place for itself among our oat varieties. In many parts of the country Sunrise is a popular variety, not only because of its earliness

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Kaffircorn and Sweet-sorghum Seed.

F. X. Laubscher, Research Officer, College of Agriculture, Potchefstroom.

KAFFIRCORN and sweet sorghum both belong to the botanical genus *Sorghum*, the cultivated forms of which probably originated in Central Africa and then spread to other countries, including South Africa. The fact that this group is indigenous and that the numerous species are fairly well adapted to the various agro-ecological regions must be regarded as the main reason why so few

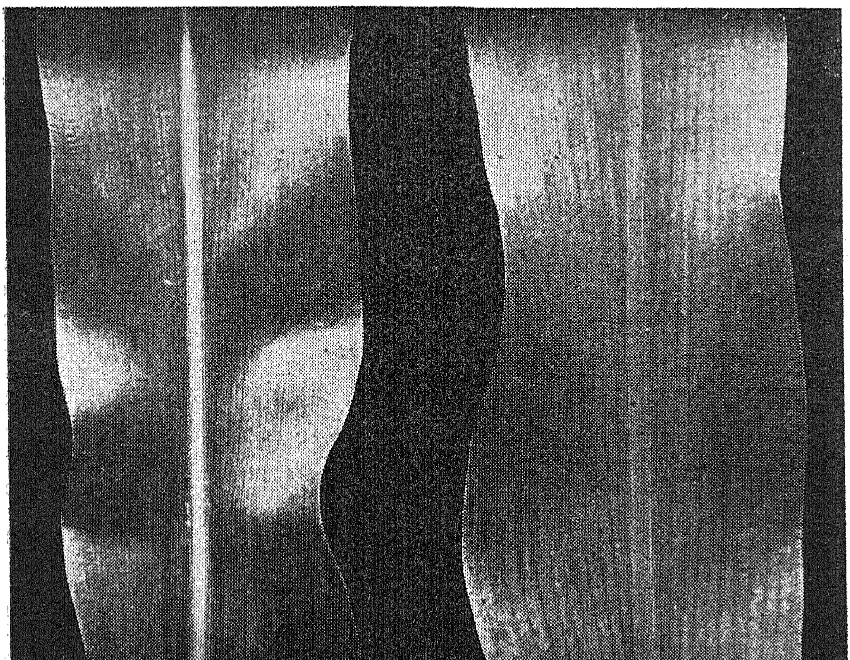

FIG. 1.—How to distinguish juicy- from dry-stemmed sorghums. The leaf on the left, with white midrib, is of ordinary kaffircorn, while that on the right, with cloudy midrib, is of sweet sorghum ("soetriet").

varieties are known to the seed trade and enjoy wide popularity. This then is the position in spite of the fact that kaffircorn ranks third in importance as a grain crop in South Africa. There is a tendency to regard this crop as inferior and, except in a few specific areas, little is done in the way of cultivating superior varieties or of paying scrupulous attention to the quality of seed.

Kaffircorn Seed.

In view of the foregoing, therefore, it is almost impossible to make definite recommendations since there really are no widely-known varieties. This does not imply, however, that outstanding varieties will not become better known in course of time and be cultivated more generally. In fact, the witch-weed resistant variety bred at the Potchefstroom College of Agriculture a few years ago and issued under the number 37.R.9 has spread with surprising rapidity and is cultivated to-day on a considerable scale in certain areas. This variety undoubtedly owes much of its popularity to the fact that

severe witch-weed infestation in those areas makes economical maize production impossible.

Owing to the damage caused by birds, the so-called "bird proof" variety has in recent years been grown on a more extensive scale. So far the market has apparently been able to absorb the increased production of this crop, but it is difficult to predict what the future position will be. A comparatively late, tall-growing "bird-proof" type is commonly grown; this is readily distinguishable, and seed which is true to type is obtainable in trade circles. Since the "bird-proof" type (i.e., varieties with a layer of brown pigment under the epidermis which, owing to its high tannic acid content during the younger stage of the seed, is bitter and, therefore, distasteful to birds) is regarded as unsuitable for the market, no work of improvement has as yet been carried out in connection with it, although the breeding of a short-stemmed, early "bird proof" variety will present no particular difficulty.

Sweet-sorghum Seed.

The position in regard to sweet-sorghum seed is not much better. Up to the present it is really only the so-called "Ambercane" types that are sufficiently well known for seed to be obtainable in the trade. These varieties mature early, but their yields are correspondingly low, whereas many of the indigenous sweet sorghum types give much higher yields. In Natal and the northern Transvaal where particularly promising types are to be found, outstanding varieties which in course of time will become better known and be cultivated on a more extensive scale can be developed by selection.

Wintersome, which is well adapted to warm areas where the growing season is not too short, is an example of what can be obtained from the indigenous sweet sorghums.

Seed Selection on the Farm.

The present position in regard to sorghum seed is, therefore, that, except for a few well-known varieties, farmers are compelled to make their own provision for seed, or else are dependent on their neighbours. It is always undesirable to obtain seed from distant areas. By practising a little selection farmers can obtain a very uniform type within a season or two, and it is in any case by far the soundest policy for them to reserve superior plants on ther own lands for seed.

Avoid isolated tall-growing plants since these are probably hybrids. Select those plants which grow vigorously and which have reasonably thick ear stalks, well-laden ears exserting well above the topmost leaf-sheaths, and suckers as high as the main stem.

In the case of sweet-sorghums where the production of succulent, sweet vegetative material is the primary consideration, the above points as well as the general vigour and uniform height of sucker development should receive special attention. In addition, these tall-growing plants must have a strong root system. The succulence of a sorghum plant is indicated by the colour of the midrib of the leaf. A white midrib indicates a dry stem, whereas the leaves of plants with succulent stems have a dull, cloudy midrib. By avoiding plants with a white midrib or even white streaks in the midrib of fully developed leaves, farmers can ensure that selections will have the necessary succulence. The sweetness of the stem can be determined by taste. In the case of both kaffircorn and sweet sorghum, farmers must be on their guard against contamination as a result of cross-pollination

which sometimes takes place to a considerable extent in this group of crops, which also includes Sudan-grass.

The seed requirements of the average grower are small and it will, therefore, fully repay him to select his seed on the land. In the case of the common varieties a lb. of seed contains from 15,000 to 20,000 seeds so that it is possible, theoretically, to plant one morgen of land with, say, 2 lb. of seed.

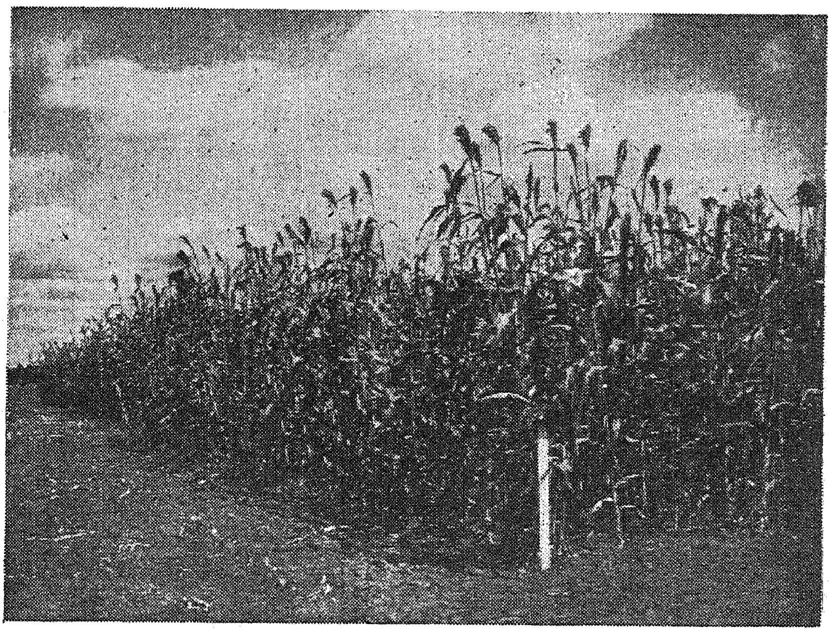

FIG. 2.—The "Haakdoring" strain of sweet sorghum ("soetriet") developed for ensilage at the Potchefstroom College of Agriculture.

Kaffircorn has a naked seed which is easily damaged by mould or rot. Often the germinating power of the seed is adversely affected by the inclusion of damp ears in a heap, where they generate heat. The selected ears should, therefore, be allowed to dry out on a dry floor or tarpaulin. When quite dry they should be threshed and stored in a place where they cannot be reached by rodents. The stored seed must also be protected against insects and fumigated if neecssary.

Kaffircorn seed is more susceptible to rot in the ground than any other cereal crop. Seed planted early in the season in cold, half dry, cloddy soil gives very poor results and often the final stand consists of only about 5 to 10 per cent. of the number of seeds planted, quite apart from the fact that in many cases lands must be replanted. Such losses can be largely eliminated by planting at the correct time and by treating the seed with a fungicidal powder, as described elsewhere in this issue.

Field Beans.

F. X. Laubscher,* Research Officer, College of Agriculture, Potchefstroom.

BEANS intended for harvesting as dried beans are known without any clear distinction in regard to their identity as kidney beans, haricot or French beans, and sugar beans. Although originally synonymous, these terms have in course of time become distinctive with the result that to-day the name "kidney bean" is used to indicate varieties with a fairly large, kidney-shaped seed, while "haricot" is the name usually applied to the group of white varieties, and "sugar beans" to the red or brown speckled variegated or "Lappies" types, although some yellow and light brown round types are also known as sugar beans.

This loose terminology obviously reflects vague trade distinctions and has no agricultural value whatever. "Small Haricot" or "Small White Haricot" may refer to any one or more of about ten different varieties and it cannot be too strongly emphasized that both farmers and seed-merchants, should make a determined effort to avoid these confusing descriptions. Varietal names give a much better and clearer indication of all the required characteristics.

Although the production of field beans consists mainly of white and speckled varieties, a considerable number of self-coloured types are also grown. The field-bean market discriminates to a certain extent against the latter, especially if their colour is very dark. Consequently, yellow and light-brown varieties find a ready sale, while dark-brown, black and purple varieties realize much lower prices. Many varieties green-bean, such as *Canadian Wonder*, *Victory*, *Black Wonder*, etc., are also cultivated for field-bean production, but the bulk of the crop is probably absorbed by the seed trade and, after being graded and sorted, resold to market gardeners. Shortly before the war a start was made with the canning of dried beans and good progress has already been made in this direction. For this purpose a small, white bean possessing cooking qualities is required. The desired qualities are best represented in the so-called "*Navy Pea*" types from the United States. One of this group which does quite well on the Transvaal highveld and which can be recommended on account of its resistance to disease, early maturity and good yield capacity is *Michigan Robust*. Owing to the scarcity of containers there has been a temporary decline in the quantity of dried beans canned, but once this difficulty has been overcome, a relative increase in the demand for this type of bean can be expected.

Suitable Areas for the Cultivation of Beans.

The most important single field-bean area is situated on the Transvaal highveld, the districts of Ermelo, Belfast, Middelburg and Bethal being responsible for as much as one-fifth of the total European production. The most important variety grown in this area is *Bomba*, also known as large white kidney, "sewejaar" or "Patat" bean. The so-called white haricot varieties, of which Round White Haricot is the most popular, are grown less extensively. Small white varieties are also grown, but rarely under a definite varietal name, and in many cases these consist of a mixture of types graded according to seed colour and size.

* In collaboration with F. H. Bosman (Middelburg, Cape), D. Retief (Nelspruit), W. Schultz (Cedara), F. M. du Toit (Oudtshoorn), and Dr. P. Vorster (Stellenbosch).

A second important field-bean area is in the neighbourhood of Koster, in the western Transvaal. In this area mainly the speckled sugar bean varieties are cultivated. Of these the co-called *Van Zyl* bean is the most popular, although some types are grown under commercial names like oval sugar, dark-coloured, round sugar, etc.

The quantity of field beans produced under lowveld conditions is small, owing to the fact that most varieties succumb to disease during the summer months. White Tepary beans (*Phaseolus acutifolius*) do well in this area, however, and should be given preference over other kinds.

In the Orange Free State there are no definite field-bean areas although the legume is grown for domestic consumption. A variety which does well, is *Small Khaki*, a small-seeded, light-brown variety with a semi-climbing growth habit and purple stems. Unfortunately, this variety is not very popular on the market.

In Natal beans are grown on a fairly considerable scale in the midlands, the most popular varieties being *Bomba*, *Victory* and *Round Yellow Sugar*. In the coastal areas, on the other hand, the speckled sugar types are grown.

In the Cape Province, the Little Karroo is an important field-bean area. In the Prince Albert district, and to a lesser extent in the Calitzdorp, Oudtshoorn and Ladismith districts, the principal type grown is the "*Painted Lady*" sugar bean, but the *Van Zyl* and *Terblanche* varieties are also quite common, and it is estimated that 80 per cent. of the production of this area consists of these three varieties. The "*vaalgroen*" variety is grown to a lesser extent. In the adjoining south-western districts from Mossel Bay to Caledon, Bredasdorp and Robertson the speckled sugar-bean varieties, are also grown, and types like *Van Zyl* and *Natal* are popular, but the "*Lappies*" variety is still the most important and is cultivated almost exclusively in the Cold Bokkeveld area, which is, in fact, the most important field-bean area in the winter-rainfall area.

Varieties.

A noteworthy fact is that in contrast to the numerous varieties of garden beans, the most popular varieties of field beans are confined to only a few types. Unfortunately, some of these varieties, like the speckled sugar beans, for example, include quite a number of types which are not only very difficult to distinguish from one another, but which, as would appear from the areas in which they are cultivated, are also restricted in their regional adaptation. The result is that where farmers do not make provision for their own seed requirements, the exact identity of the variety obtained elsewhere cannot always be relied upon. On the other hand, many of the varieties are undoubtedly synonymous, so that the present multiplicity of names is only confusing and of little importance.

While practically all our field-bean varieties with the exception of a few *Lima* types from the north-western coast of the Cape Province, and *Tepary*, from the northern Transvaal, belong to the *Phaseolus vulgaris* group, the *Bomba* variety falls under *Phaseolus multiflorus*. This species consequently possesses the distinctive characteristics of this botanical group, i.e., it is a perennial with a thickened tuberous root, is a climber with large racemes and, therefore, has an almost unbroken flowering period during the growing season and bears fibrous pods with transverse threads and large kidney-shaped seeds which in this variety, are white in colour although covered with a fine network of veins which turn black when the bean is cooked.

Bomba does not produce a dried bean of very good quality, since, in addition to showing a fine, black network when cooked, the seed also has a hard testa which generally separates from the inner portion during the cooking process, with the result that the prepared product is full of loose, tough seed coats. There is a ready sale for the seed as a food for mine natives, however. *Bomba* does well on the highveld, is resistant to drought and disease and is less liable to damage by eelworm than other varieties. Owing to its prolonged flowering period it is also a safer bean to grow than the common varieties which produce a greatly reduced yield if severe drought conditions prevail during the flowering period. On the other hand, experiments have shown that it is functionally sterile, i.e., no seed formation takes place unless the flowers are manipulated. In the field the flowers are probably tripped by insects or wind, with the result that fertilization can then take place. This characteristic may be partly responsible for the fact that seed setting may be very poor during some seasons. Another very important characteristic of this variety is its subterranean germination. The cotyledons are not pushed up above the ground, and the effect of this may be that under certain soil conditions the crop produces a better stand than the ordinary large-seeded varieties which sometimes "break their necks" during germination if the soil has formed a crust.

Since the demand for *Bomba* beans is not unlimited, it might be advisable for highveld farmers to plant more small white beans of the *Robust* variety. This is a fast-growing bean and can, therefore, be planted later than *Bomba*. In fact, if it is planted too early, it might ripen while the season is still very rainy and, consequently, be damaged. The plants should be pulled up in good time to prevent loss through shattering.

A variety which generally enjoys considerable preference on the market, is the round yellow sugar bean, which is one of the best cooking beans and also very popular for domestic use. Unfortunately it is difficult to store in the dried form since it is very susceptible to attack by weevils. This bean is an early, medium dwarf variety which does not produce very good yields. Owing to the high prices realized, this bean is grown fairly extensively on the highveld.

The speckled sugar types vary in regard to their growing period, growth habit, seed size and shape, colour intensity and pattern. *Van Zyl*, for example, one of the most popular varieties in this group, bears large seeds with a clear variegated pattern, matures late and has a semi-climbing growth habit. The *Natal Sugar* bean on the other hand, is somewhat earlier, the seed smaller, the ground colour duller, and the growth habit more definitely that of a dwarf variety. In the case of the "*Lappies*" bean which also belongs to this group, the variegated pattern is confined to a patch around the hilum or "eye", the under-side of the bean being white.

As a group, the sugar bean varieties are very popular on the market and fetch higher prices than the other types. In this respect differences also exist within the group itself, based sometimes on the clearness of the colouring and attractiveness of appearance, but sometimes also on the area from which they come. So, for example, the "*Lappies*" bean from the Cold Bokkeveld is in great demand, the reason given being that it is less susceptible to weevil attack. Although differences in this respect admittedly exist between varieties, the alleged resistance to the "*Lappies*" bean in this case is probably due rather to the absence of infestation in the field and to

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Production of Pasture-crop Seed.

L. C. C. Liebenberg, Professional Officer, Division of Soil and Veld Conservation.

THE production of pasture-crop seed has become an urgent necessity. On many farms cultivated soils have become so exhausted and the grazing has deteriorated to such an extent that the application of measures for their reclamation can no longer be postponed. The value of pasture crops in the improvement of both exhausted lands and deteriorated grazing has been conclusively proved by the Department and by successful agriculturists over a number of years in various areas. In this task of reconstruction seed of suitable crops is required: (1) for the control of soil erosion, (2) for the reclamation of damaged veld, exhausted and old lands, (3) for the cultivation of fodder crops, both for grazing and hay and (4) for use in rotational cropping with cereals or for replacement of the latter. Adequate grazing and supplies of feed ensure that measure of stability which is a pre-requisite in any successful farming system.

Exotic Pasture Crops.

Several exotic hay and pasture crops have already shown that they deserve a prominent place in our agriculture. These crops are already being extensively grown in certain areas, and include the following, namely, rye grasses, rescue grass, canary grass, cocksfoot, tall fescue, red clover, white clover, subterranean clover, strawberry clover, Alsike clover, white sweet clover and vetches. Most of these crops grow or remain green in winter. Before the war, seed was usually imported from overseas, but owing to the dislocation of importation and the increased demand in the producing countries themselves, seed must now to a large extent be produced locally. This can be done most effectively in the areas to which these crops are best adapted, namely, the higher-rainfall areas situated at higher altitudes, as for example on the highveld of the Transvaal, Orange Free State, Natal and the Cape Province.

Indigenous and Other Summer Pasture Crops.

With the exception of Rhodes grass, indigenous pasture crops are not yet being cultivated on any appreciable scale. They can occupy an important place in our agriculture, however, especially in areas where the climate is too unfavourable for exotic species. The indigenous group includes summer grasses and Karroo plants as the salt bushes, " ganna " bushes and " klappiesbrak ". The grasses include certain finger grasses, buffalo grasses, wild millet grasses and the exotic *Paspalum* and Sudan grass.

The cultivation of summer grasses is not a general practice in any particular area. Although many of these grasses come from sub-tropical and tropical regions, it has already been proved that some of them are well adapted to the highveld. Seed production can be undertaken in grassveld areas where the average annual rainfall is at least 20 to 22 inches. In areas with a lower rainfall, satisfactory results cannot be expected without irrigation.

Some of the better indigenous grasses like Nelspruit finger grass, *Acroceras macrum* and Limpopo grass, either set very little seed or none at all, while others like certain buffalo grasses need a long growing season and, consequently, produce seed only in the lowveld.

Hints for Seed Production.

(*a*) *Preparation of the Soil.*—Where pasture or fodder crops are planted with a view to seed production, they will necessarily also have to be used as pasturage and to provide feed. Since pastures are expected to yield as high a production as ordinary farm crops, similar attention must be given to the fertility of the soil. Seed production will not be remunerative on exhausted soils. Contour embankments on slopes, or on any soil which is subject to erosion, will help to create better conditions for the fullest development of pasture crops. The conservation of humus, manure or any plant material and a regular supply of soil moisture are essential for the establishment and longevity of the crops.

(*b*) *Harvesting of Seed.*—It is important to ensure that the seed is harvested at the right time. The best moment must be determined fairly accurately for most crops. Only a small margin can be left so that, as a rule harvesting of the seed crop does not allow of any delay if the whole stand is of the same age. Lack of uniformity in the latter respect will make it more difficult to determine the right moment for harvesting. Although each crop has its own peculiarities there are certain signs which indicate the right moment for harvesting. Rye grass, for example, is ready for harvesting when the first seeds shatter. In the case of cocksfoot the seed can be harvested as soon as the ears assume a golden colour, and at this stage a few seeds will be shed when the ears are lightly shaken. The seed of white and red clover can be harvested when the seed heads become brown. Less seed will be lost if the plants are cut when there is dew on them.

What Farmers can do.

By collecting their own seed, farmers can help to solve the problem of deteriorated veld and lands, and can also assist their fellow-farmers with supplies of seed. So, for example, in areas where pure stands of red grass (*Themeda triandra*), wild millets, buffalo grasses and finger grasses occur, their seed can be harvested. There is a pressing need for steps in this direction and farmers should consequently give the matter their serious consideration. Some farmers are already improving their veld in this way. Wherever possible, farmers should establish their own seed associations through which the cultivation, cleaning and marketing of seed can be facilitated. Co-operation will considerably reduce the production costs. Since it is difficult to-day to import special machinery for harvesting and cleaning seed, farmers will have to do the work as best they can without it. It is impossible within the scope of this short article to deal exhaustively with the cultivation and seed production of each individual pasture crop. Those who would like to obtain more detailed information, are requested to write to the Chief, Division of Soil and Veld Conservation, Pretoria.

What the Department is Prepared to do.

In order to ensure that no time is lost in the restoration of deteriorated lands and pastures, the Department is prepared to assist seed-growers in such a way that the seed-production industry can be built up on a sound foundation. Where possible, personal attention will be given to growers. This assistance includes the making available of new types of pasture crops, visits and inspections, the testing and certification of seed, and the publication in *Farming in South Africa* of the names of seed growers and of particulars of the seed grown by them. In order to prevent failures, it is recommended that those who intend to undertake seed production, should first make

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Soya Beans, Cowpeas, and other Legumes.

Dr. A. R. Saunders, Senior Professional Officer, Division of Animal and Crop Production.

APART from lucerne, soya beans and cowpeas are undoubtedly the most important leguminous hay crops grown. An ever increasing production of these and other leguminous crops as protein-rich feed for animals and as soil builders in rotation with maize and other crops would be one means towards balanced farming and permanent agriculture. In addition, there is a great future for

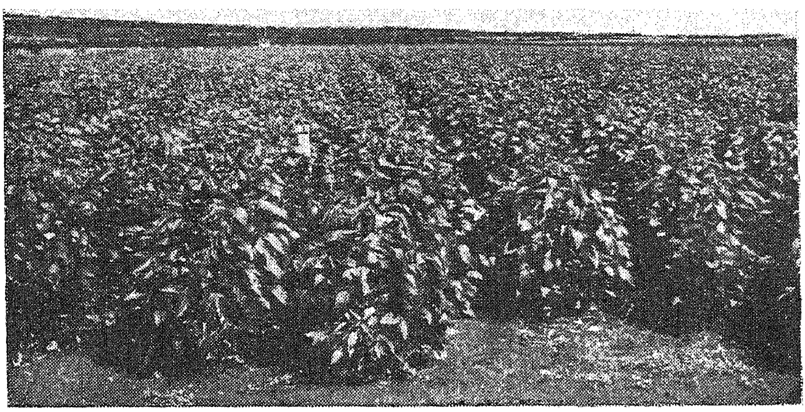

FIG. 1.—A field of strain 35.S.277 soya beans standing to a height of 3 ft. at the time of flowering.

[College of Agriculture, Potchefstroom.

the soya bean as a seed crop, though large-scale developments in this direction will require a general improvement in the standard of farming and the use of labour-saving machinery.

Soya Beans.

As a hay crop, the soya bean has already established itself firmly in the more favourable parts of the summer rainfall area, but owing to inexperience on the part of farmers, high prices of competitive crops, and the lack of proper machinery for handling the crop, seed production has not made the progress expected a few years ago. This fact is, however, no criterion of the possibilities of the crop, and there is no doubt that the soya bean will in future occupy a far more important position in our agriculture than it does to-day.

Unlike in the case of maize, soya beans are still planted far too thinly. The common practice is to plant at the rate of 35-40 lb. per morgen, whereas at least double, or, if planting is done in 18 inch rows, treble this quantity of seed should be used. Details concerning methods of production are irrelevant to this brief discussion, but a few practical hints might not be out of place. In the

first instance, if a maize planter is employed, thicker plates should be used. A plate ¼ inch in thickness gives uniformly good results and usually obviates nearly all the seed breakage which is so often responsible for poor stands. Secondly, planting should only take place on soil which is moist enough for the seed to start germinating immediately, and the depth of planting should be carefully regulated so as not to exceed 1½ to 2 inches.

For threshing the beans any wheat thresher can be used provided special sprockets or pulleys are fitted so as to reduce the speed

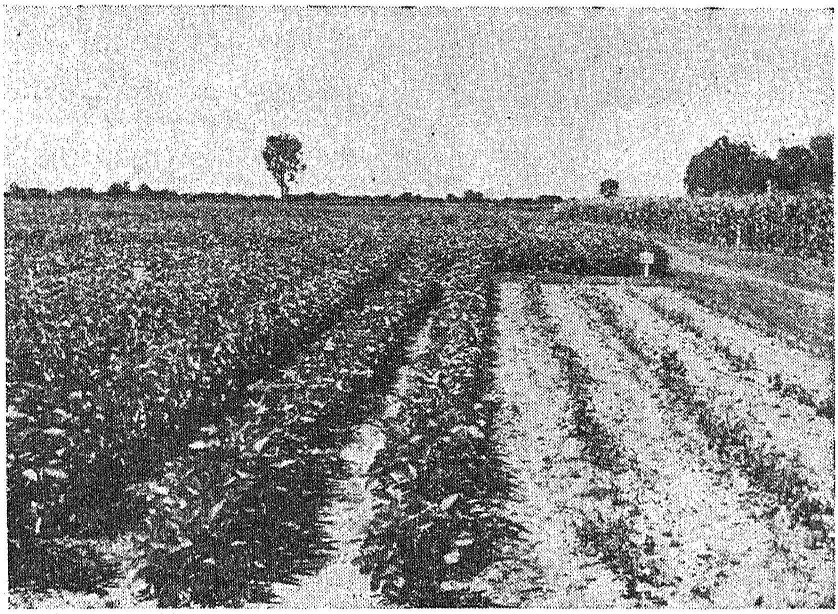

FIG. 2.—Unadapted varieties of soya beans do not pay. To the right: An imported variety of very early maturity but low yield; to the left and in the background: Strains bred at Potchefstroom College of Agriculture.

of the drum to not more than 500 r.p.m. Removal of one or two rows of concave teeth and replacement of the top screen, if it is of metal, by a wooden screen are additional aids to successful threshing. A certain amount of splitting of the seed is, however, unavoidable, but the splits can be removed readily by passing the seed over a $^3/_{16}$ inch by ¾ inch screen.

Soya-bean seed is not readily damaged by insects and rodents and will retain its viability for at least three years if thoroughly dry and stored in a cool place. Seed with a high moisture content deteriorates rapidly and may lose its germinability entirely within a year.

Varieties.—The time is past when farmers need concern themselves about the old varieties such as Mammoth, Brownie, Chinese White, and others. The market requires a yellow bean and the new non-shattering strains are all of this type. Of the first of these strains distributed Nos. 34.S.51, 34.S.256 and 34.S.395 have given the best results. This does not mean that they cannot be improved upon, for already superior types are in the course of development. In this regard two new strains give particular promise, viz., 35.S.277 and 38.S.58, and it is hoped to have seed of the former available for distribution next year and of the latter the year after. Strain

35.S.277 is the earlier of the two in maturity and should prove suitable for highveld conditions, while 38.S.58 is likely to give its highest returns in areas with a growing season of at least 135 days.

Cowpeas.

In relatively dry areas the cowpea is a more reliable crop than soya beans. On the other hand it is much more sensitive to excessive moisture. At Potchefstroom this year cowpeas have suffered seriously from water-logging of the soil, while soya beans on the same soil show no injury at all.

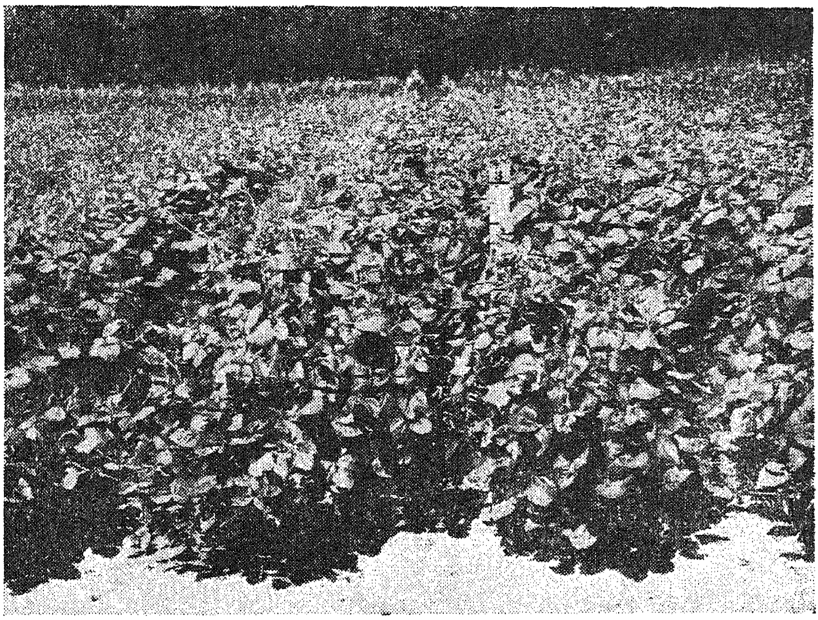

FIG. 3.—Strain 37C6 upright cowpeas nearly 3 ft. tall at the time of flowering.

[College of Agriculture, Potchefstroom.

The same remarks apply to cowpeas as to soya beans as regards the necessity for closer spacing than is commonly practised. This is especially true of the upright types, for at a comparatively wide spacing the procumbent varieties are able to compensate by forming more and longer vines, while the upright strains are comparatively limited in their growth capacity. The yield per plant of the latter is much lower than in the case of the procumbent varieties, but experiments have shown that by closer spacing at least as good yields can be obtained from the upright as from the procumbent types, with the added advantage that the upright strains can be cut with an ordinary mower if the stand is thick enough. A wide stand leads to lodging or sprawling, and the best procedure is to plant in rows not more than 30 inches apart and 2-3 inches in the row. On relatively clean land, rows from a 36 inch or 42 inch planting can be straddled to give a distance of 18 inches or 21 inches between rows, with marked advantages both as to yield and ease of harvesting.

As the cowpea is of an indeterminate growth habit and some pods may be ripe while the plants are still flowering profusely, the best method of obtaining uniformly mature seed is to harvest the

pods by hand as they mature. But this is laborious and impossible on a commercial scale, unless an abundance of cheap labour is available. For extensive seed production the crop should be left until the majority of the pods are ripe, and then cut and handled in the same way as soya beans. Shrivelled, immature seed can be removed by strong blast, or, together with split seeds, by using a $\frac{1}{8}$ inch by $\frac{1}{2}$ inch screen.

Cowpea seed is easily damaged by high moisture content and is subject to injury by weevil, so that stringent precautions should be taken to avoid losses. If fumigation cannot be carried out the seed can nevertheless be kept relatively free from weevil during warm weather by spreading it out once a month for a day in the hot sun on tarpaulins or suitable floors from which it can be readily gathered again.

Varieties.—Amongst the procumbent varieties Iron, New Era, and Bechuana White are the best known. Only one upright strain, No. 34.C.361, has so far been extensively grown, but others are being bred which are likely to prove superior. At least one of these, No. 37.C.6, has reached the stage where it can be increased for seed.

Velvet Beans and Dolichos Beans.

In the bushveld and lowveld of the Transvaal and the warmer parts of Natal, Velvet and Dolichos beans usually give considerably higher yields than either cowpeas or soya beans, and they deserve far greater attention than they have hitherto enjoyed. At the Experiment Farm of the University of Pretoria, Dolichos beans have been outstanding* while in relatively dry lowveld areas Semerset Velvet beans have yielded exceptionally well. This variety is sometimes also spoken of as the Sussex bean. Both types are, however, unsuited to highveld conditions owing to the coolness of the climate and the shortness of the growing season.

* Data supplied by Professor D. J. Haylett.

Oat-variety Trials :—

[*Continued from page* 242.

and outstanding palatability, but also on account of its rust resistance, however slight that may be. Although Boone is later, it is much finer and a better yielder and might thus prove to be a strong competitor.

Finally it must again be pointed out that the above experiment in no way gives an indication of the suitability or otherwise of the varieties under discussion for dryland conditions, where Algerian is the predominant type.

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(²) DE VILLIERS, P. J. R. and SIM, J. T. R.: A classification and description of oat varieties: Science Bulletin No. 92 (1930).
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Field Beans :—

[*Continued from page* 248.

the low moisture content of the dried bean than to any inherent resistance to weevils.

Until such time as the various kinds of sugar beans and White Haricot varieties have been properly tested out and classified, it would be advisable for growers either to keep their own seed requirements or to buy only such seed as can be identified beyond all doubt.

Stratification of Seed for the Production of Seedling Stocks.

D. du Preez, Western Province Fruit Research Institute, Stellenbosch.

AS a general rule nurserymen do not have much trouble with the germination of peach stones because the numbers usually available for stratification in sand pits ensure enough seedlings even if only a small percentage germinate. However, during seasons following warm winters the stones planted germinate badly and irregularly, causing great inconvenience and no small loss to the nurseryman.

In the following Table the percentage germination is given for the best stratification period for each kind of fruit and treatment. Peat was used as a medium for stratification. In some cases the seeds were stratified outside for certain periods before placing them in cold storage.

Season.	Variety or Group.	Treatment during Stratification.	Percentage Germination.
1939...	Muir...............	9 days outside and 70–90 days at ± 40° F. in moist peat...............	22·8
	(1) Kakamas (*a*)......	9 days outside and 90 days at ± 40° F. in moist peat....................	10·0
	(2) Kakamas (*b*)......	9 days outside and 90 days at ± 40° F. in moist peat....................	22·4
	Royal apricot........	9 days outside and 44 days at ± 40° F. in moist peat....................	40·8
1940...	(3) K_2 (*a*)...........	53 days in moist peat, at ± 40° F.....	58·8
	(4) K_2 (*b*)...........	53 days in moist peat, at ± 40° F.....	27·2
	K_2 (*a*)...........	81 days in moist peat, at ± 40° F.....	43·2
	K_2 (*b*)...........	81 days in moist peat, at ± 40° F.....	34·0
	Royal apricot........	32 days in moist peat, at ± 40° F.....	32·4
1941...	(5) K_1 (*a*)...........	70 days in moist peat, at ± 40° F......	5·33
	(6) K_1 (*b*)...........	70 days in moist peat, at ± 40° F......	34·0
	K_2 (*a*)...........	70 days in moist peat, at ± 40° F......	2·16
	K_2 (*b*)...........	70 days in moist peat, at ± 40° F......	37·3
	Royal apricot........	42 days in moist peat, at ± 40° F......	60·0
	Bitter almonds.......	70 days in moist peat, at ± 40° F......	27·0
	Jordan almond.......	42–56 days in moist peat, at ± 40° F..	63·0
	Semi soft almonds....	56 days in moist peat at ± 40° F......	49·0
	Mazzard wild cherry..	85 days in moist peat, at ± 40° F.....	42·0
	Wild pear seed.......	70 days outside and 43 days at ± 40° F. in moist peat......................	69·33
1942...	K_1 (*a*)..............	45 days in moist peat, at ± 40° F......	5·0
	K_1 (*b*)..............	45 days in moist peat, at ± 40° F.....	32·0
	K_2 (*a*)..............	84 days outside and 45 days at ± 40° F. in moist peat.....................	51·3
	K_2 (*b*)..............	84 days outside and 45 days at ± 40° F. in moist peat.....................	76·3
	Wild pear seed.......	28 days outside and 89 days at ± 40° F. in moist peat.....................	56·5
	Bitter almond........	59–73 days in moist peat, at ± 40° F.	41·5

(1) Kakamas (*a*) means that the stones were dried outside.
(2) Kakamas (*b*) means that the stones were dried in the packshed.
(3) K_2 (*a*) means Kakamas stones of the second big crop dried outside.
(4) K_2 (*b*) means Kakamas stones of the second big crop dried in packshed.
(5) K_2 (*a*) means Kakamas stones of the first big crop dried outside.
(6) K_1 (*b*) means Kakamas stones of the first big crop dried in packshed.

During the four years 1939 to 1942 extensive experiments were carried out with seeds of different kinds of fruit to ascertain the number of days of stratification required to get the best germination. Attempts were made to stratify the seed outside in pits and in frames erected above ground; however, the best results were obtained by placing the seeds at least for a time in cold storage. The temperature at which the seeds were stored was approximately 40° F., since it has been established by many previous investigators that this is the most suitable temperature for the after-ripening of most kinds of fruit seeds.

Although the results in the table do not cover the whole field of investigation, they serve as a basis for certain recommendations which may be of some value to nurserymen. Nurserymen who have any difficulty with the germination of certain seeds will find the Table a useful guide.

The Kakamas Clingstone peach has been planted extensively of late and is becoming one of the most important varieties for the production of peach stocks. For this reason it was deemed advisable to carry out most of the tests with Kakamas stones. The germination of some wild pear seeds was also tested as the importation of pear seeds and seedlings has been prohibited.

Recommendations.

Kakamas.—There are indications that the stones of the second big picking of Kakamas germinate better than those of the first picking; moreover, it is advisable to allow the seeds to dry in the packing shed instead of out of doors. After the stones are dry enough they can be stored in boxes prior to stratification. The highest percentage germination was obtained with K_2 (*b*) during 1942 (76·3 per cent.). In this particular case the seeds were kept outside for 84 days and afterwards cold stored at 40° F. for 45 days. The total stratification period in moist peat was therefore 129 days. Seeds should be kept moist but not too wet during stratification. Where stones were placed into the cold storage in the dry state, the germination was nil. From this it can be deduced that both low temperature and moisture are of importance for the after-ripening of the seed.

Wild Pear Seed.—The pear seed with which the experiments were carried out, were very kindly supplied by a nurseryman who had experienced some difficulty with the germination of his seed. From the results obtained the following conclusions can be drawn:—

(1) It appears essential to stratisfy the seeds out of doors in moist peat for a certain period, and afterwards at ±40° F. There was a big difference in the pre-cooling periods used for the two seasons, but the total stratification period was of approximately the same duration (116 days in 1941 and 117 days in 1942). The 1941 treatment gave the best germination, and due to the shorter cold storage period is cheaper in practice.

(2) It was found to be very important to separate the seed from the pulp as soon as possible and not to allow it to ferment. The pears should be crushed and the seed saparated from the pulp by washing it repeatedly over a sieve, and drying the seeds indoors. If the process is properly carried out, the seeds should retain their natural brown colour instead of turning black. The percentage germination of a sample of seed obtained from a nurseryman was found to be much lower than that of a comparable sample in which the seed was separated immediately from the pulp.

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General Vegetable-seed Situation.

Dr. J. W. Pont, Division of Horticulture, Pretoria.

DURING the years between World War No. 1 and the beginning of the present conflict, practically all vegetable seeds used in the Union were imported. Some seed was produced locally, in particular Cape Spitz cabbage, cauliflower, onion and pumpkin, but an unwarranted prejudice again local seed, and low costs of imported seeds of various kinds, prevented the development of a South African seed industry.

The origin of the prejudice probably lies in the fact that would-be producers of vegetable seed did not apply the principles of selection during the growing season, which are essential to maintain the purity of strains and varieties. Indifferent results were ascribed only to environmental conditions, South Africa being considered unsuitable for seed production. This opinion has had an adverse effect on local enterprise.

As a result of the above-mentioned conditions, South Africa depended on countries beyond our shores for most of the essential seeds. The total weight of seed obtained in this manner during 1939 is estimated at between 600 and 800 tons.

When the control on vegetable seeds came into operation in the beginning of 1942, it became evident that the Union would need to produce large quantities of vegetable seeds to safeguard its food supplies. As a result of world-wide hostilities, several sources of seed supply were eliminated, and shipping conditions became so irregular that the arrival of seeds could not be relied upon.

Survey of Seed Position.

In order to obtain an accurate picture of the vegetable seed stocks available in the Union, a survey was taken by the Division of Horticulture. The seed merchants of the Union supplied the necessary data which enabled the Department to assess the quantities of seeds of all kinds of vegetables that are required annually to feed the nation, and also the quantities necessary to maintain the essential stocks at a reasonably safe level. By means of monthly returns, supplied by the seedsmen, giving particulars of all seed on hand, the levels of the various stocks could be followed and an adequate system of control devised.

Exports to neighbouring territories had to be adjusted with reference to the stock seed position, and whilst it was in the best interests of the seed trade to maintain such exports, quantities had to be reduced considerably for several kinds of seeds. Maximum quantities for the export of each vegetable seed were, therefore, fixed and no person outside the Union was permitted to receive more than the maximum quantity of each kind, once a month.

Restricted imports served the same purpose. It would have been useless and wasteful to allow the import of excessive quantities of some kinds of seeds without due regard to the fact that a shortage might exist for other kinds. The Seedsmen's Association rendered material assistance by submitting their import orders simultaneously and by adjusting their orders to the country's needs.

The increased area under cultivation, and consequent production of local seed during 1942, and particularly during 1943, has consider-

ably improved conditions generally, so that for the year 1944 no more than about 16 tons of all kinds of seeds need be imported.

Table showing Seed Position: January, 1944.

	Annual Requirements.	Stocks on Hand.	Expected Total Local Production.	Contracted Local Production.
	lb.	lb.	lb.	lb.
Beans (Broad)	15,000	34,000	30,000	3,000
Beans	400,000	224,000	400,000	150,000
Beet	31,000	10,000	28,000	28,000
Cabbage (Total)	16,000	18,000	—	—
Cape Spitz	2,000	8,000	27,000	17,000
Carrot	44,000	40,000	60,000	70,000
Cauliflower	4,000	11,000	13,000	13,000
Celery	1,300	500	400	250
Chard	3,500	3,000	2,000	600
Cucumber	5,000	200	2,500	4,000
Eggplant	500	400	250	220
Endive	—	—	100	20
Kohl Rabi	1,300	300	200	100
Leek	500	1,700	3,000	4,700
Lettuce	5,700	3,400	1,500	4,000
Melon	2,000	1,300	1,000	1,900
Onion	11,000	13,000	14,000	28,000
Parsley	2,800	700	600	400
Parsnip	4,000	2,500	2,000	2,000
Peas	600,000	652,200	400,000	150,000
Pumpkin	8,000	5,000	24,000	4,000
Radish	15,000	5,500	1,000	200
Squash and Marrow	15,000	9,600	10,000	8,000
Tomato	5,400	3,500	3,000	1,200
Turnip	23,000	19,000	5,000	2,000
Watermelon	8,000	1,400	2,000	200

Stratification of Seed for the Production of Seedling Stocks :—

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(3) It appears that the viability of seed from different parent seedling trees varies considerably. It was suggested to a nurseryman, to test this matter out. He found striking differences where seeds from different seedling parent trees were planted, varying from an excellent to a very poor stand. If a nurseryman has a number of wild pear trees, it will be to his advantage to determine which trees produce seed which germinate well.

Wild Mazzard Cherry Seed.—It was unfortunately only possible to procure cherry seed during one season (1941). However, the experiment showed clearly that it was absolutely necessary to precool the seed at $\pm 40°$ F. Immediately after the seeds were removed from the fruit, some of them were planted in tins. Of those seeds not one germinated. The quantity of seed available for experimentation was rather limited and thus only a few treatments could be given. Nevertheless, a percentage germination of 42 per cent., as shown in the Table, is of considerable value in practice.

A Vegetable-seed Industry for the Union.

Inspection and Standardisation of Varieties.

H. van Elden, Senior Horticulturist, Division of Horticulture, Pretoria.

A SURVEY made at the beginning of the war revealed that for the past twenty to thirty years a small group of seedgrowers in the Union were engaged in building up a local seed industry, notwithstanding the keen competition from imported seed. A notable advancement was made with these kinds and varieties of vegetables peculiar to South Africa, such as Boerpumpkin, Cape Spitz cabbage, Southern Cross cauliflower, Cape Flat and Cape Straw onion seed.

In view of the fact that war conditions could seriously affect the country's food position by causing restrictions in shipping and uncertainty in the arrival of consignments on time, it became imperative to expand and improve local vegetable seed-production to meet this national need.

To stimulate and to place local production of good seed on a sound basis, the Division of Horticulture functioned as intermediary between the seedmerchants and seedgrowers. Where necessary, contacts have been established with prospective seedgrowers, assisting them with cultural and other advice. The statistical information collected and tabulated by the Division of Horticulture, which has been responsible for administering the Government control of vegetable seed imports, has proved extremely useful in guiding local production. Through the close co-operation of the Seedsmen's Association of South Africa the general adoption of seedgrowing contracts, entered into with seedgrowers, has also materially assisted in limiting production to essential vegetable seeds and guaranteed the seedgrowers an assured market at fixed predetermined prices.

Registration Scheme.

To protect the genuine vegetable seedgrower in his enterprise and still further improve on the quality of his product, the Division of Horticulture inaugurated a voluntary crop registration scheme, gazetted as Government Notice No. 1336 of 23 July 1943, whereby vegetable seedgrowers can have their seedcrops regularly inspected by officers of the Department of Agriculture and Forestry, and, where approved, dispose of such seed as "Government Approved" seed. Growers producing under this scheme pledge themselves that all crop reports may be made available to intending purchasers. The seed-trade is also kept informed by the Division of Horticulture as to growers from whom "Government Approved" seed can be obtained. The publicity thus given to "Government Approved" vegetable seed has had the effect of restricting the indiscriminate sale of seeds. With experience gained this year it is hoped further to extend and improve the system of crop inspection. To obtain a fair idea of the performance of seed grown under this scheme, samples submitted are tested at trial grounds situated in different parts of the Union. Information so obtained, on yield and quality, is passed on to the seedgrowers to enable them to improve their product.

The following table gives the most important vegetables in the Union, the most suitable varieties, and characters of interest.

Standard List of Varieties.

Vegetable and Variety.	Characters of Interest.
Asparagus:	
*Mary Washington..........	Spears large, green, with tight purple-tinted tips of fine quality.
Beans (Dwarf):	
Canadian Wonder..........	Heavy bearing over a long period, suitable for cool season, stringy in warm weather, stands transport well.
Black Wonder.............	Heavy bearing over a long period, suitable for cool season, stringy in warm weather, stands transport well, resistant to bacterial wilt.
Long Khaki...............	Long straight pods inclined to be variable as regards length of pods.
Victory Africander........	Long straight pods, good cropper.
Long Tom.................	Heavy bearer, long pods.
*Burpee's Stringless........	Stringless, good consistent bearer, suitable for canning.
*Refugee..................	Stringless, good cropper, pods inclined to be light coloured, suitable for canning.
Pencil-Pod Black Wax.....	Heavy bearing, yellow-podded variety, resistant to bacterial wilt.
Montd 'Or...............	Heavy bearing, yellow-podded variety, resistant to bacterial wilt.
Beans (Pole):	
Kentucky Wonder (Match-outstanding strain)	Heavy, consistent bearer, long, almost stringless pods.
Italian Runner............	Heavy bearer, hardy, inclined to be stringy.
Everbearing...............	Heavy bearer, pods long, almost stringless.
Mors s Pole	
Broad Beans:	
Hangdown Longpod.......	Heavy bearer, pods long, hanging down.
Beet:	
Flat Egyptian.............	Early maturing, bad for zoning in summer.
Crossby Egyptian..........	Early, flat round beet of good colour.
Eclipse...................	Round, inclined to show lighter zones, dark-red, purple-tinged.
*Detroit Dark-red..........	Turnip-rooted, dark-red colour, suitable for canning.
*Ohio Canner..............	Selection of Detroit, suitable for canning.
Cabbage:	
†Cape Spitzkool............	Very hardy, midseason to late, cabbage of good dark green colour, some strains lack uniformity of type.
Summer Spitz or Oxhart..	Selected for summer sowing.
Jers y Wak field	
Copenhagen Market........	Early; small firm round heads; medium green in colour; few outer leaves.
Glory of Enkhuizen........	Early; small firm round heads; light green in colour; few outer leaves, inclined to be wavy at the edges.
Flat Dutch...............	Drumhead type; medium green; size ± 6.
Red Rock.................	Round, firm, medium-sized heads, dark-red.
†Drumhead Savoy..........	Large, oval, round heads; crinkly leaves, dark green.
Carrots:	
‡Chantenay................	Medium, long, tapering, stump-rooted different strains.
‡Nantes...................	Long, cylindrical roots, small core, fine quality, inclined to be brittle.
Danvers Halflong.........	Roots long and tapering, suitable for autumn and winter planting, inclined to be coarse.
Cauliflower:	
Early Snowball...........	Early; heads small and of fine quality, widely adaptable.
Early Italian Giant........	Early; heads small and of fine quality, widely adaptable.
All the Year Round.......	Midseason; heads medium-sized.
Reliance..................	Midseason; heads medium-sized.
Late Italian Giant.........	Heads large, late variety.
Southern Cross............	Heads large, late variety, suitable only for certain conditions.

* Suitable for canning.
† Suitable for dehydration.
‡ Suitable for dehydration and canning.

Vegetable and Variety.	Characters of Interest.
Celery:	
Giant Pascal..............	Hardy green-leaved variety, highly resistant to leafspot.
Cucumbers:	
Cool and Crisp............	Fruits long, darkgreen, tapering at both ends; when young, white, spines; firm flesh.
*Early Fortune............	Fruits darkgreen, slightly tapering white spines when young.
*Ford Rook famous, Long Green..................	Improved and Straight Eight—ditto pickling.
Eggplant:	
New York Improved Long Purple	Early variety, fruits small, dark purple, oblong-oval in shape.
New York Improved Short Purple	Midseason-late variety; fruits short and large; dark purple; broad-oval.
Kale:	
Scotch curled.............	Leaves darkgreen or blue-green, plume-like, wide-spreading with cureld edges.
Lettuce:	
New York (various strains available for different conditions)	Large, green, curled-leaved heading lettuce—heads conial or round, with well blanched heart.
Muskmelon—Spanspek:	
Hale's Best..............	Fruits oval-round, small, coarsely netted, flesh light orange, firm.
Cape Sweet Melon.........	Fruits oval-elongated, large, finely netted, flesh deep-orange, soft, aromatic, not so suitable for transport.
Honeydew................	Almost round, light-green fleshed, smooth skin.
Cape Giant, Rocky Ford	
Onion:	
Early Cape Flat..........	Flat-round, medium-sized scales, light straw colour, thin, brown halo around stem end, flesh nearly white, mild early.
†Late Cape Straw Colour...	Round, deep, flat—skin light straw colour, flesh nearly white—late.
Australian Brown, Spanish Brown	Globular, firm onion; keeps well; skin deep brown, often inclined to be purple.
†Silver King..............	Round, deep, flat to top-shaped; white thin flaky skin; flesh white—midseason; lacks uniformity of type.
†White Barletta...........	Round, deep, flat to top-shaped; white thin flaky skin; flesh white—midseason; lacks uniformity of type.
Parsley:	
Moss Curled..............	Plants compact, dark bright green leaves, much curled.
Parsnip:	
Hollow Crown.............	Roots creamy white, uniformly tapered, 10–12″ long, $2\frac{1}{2}$″–3″ in diameter at shoulder; hollow crowned.
Peas:	
*Greenfeast...............	Widely adaptable, pods slightly curved, good cropper, good shipper, used for canning.
*Perfection...............	Pods slightly curved, short, good cropper, suitable for canning.
Meteor...................	Early round-seeded variety suitable for cool areas.
Black-Eyed-Susan.........	Round-seeded hardy variety suitable for fairly warm conditions—inferior quality.
Stratagem................	Old variety of fine quality, late, large pods, various strains.
Stomppeul................	Old Cape variety, short, blunt pods; hardy; early.
Peppers (Capsicum):	
†California Wonder........	Fruits usually four-lobed, smooth, uniform and deep green changing to bright crimson, flesh thick, sweet and mild.
Chili....................	Low spreading plant, fruits conical, green, changing to bright red, pungent.

* Suitable for canning. † Suitable for dehydration.

Vegetable and Variety.	Characters of Interest.
Pumpkins:	
Flat Boer Pumpkin........	Fruits very flat, round, greenish; white stem and blossom-end depressed, flesh thick, orange-yellow, of fine quality.
Iron Bark................	Fruits large, round, oval, somewhat ribbed, flesh thick, orange-yellow, coarse.
Kromn k................	Fruit cylindrical crook d n ck.
C ylons tip , Kaaps so t.	
Radish:	
French Breakfast..........	Early variety, roots oblong, thicker towards the bottom, dull red with white tip $1\frac{1}{4}''$ long, $\frac{1}{2}''$–$\frac{3}{4}''$ diameter.
Cycl , China Rose	
Sparkler..................	Roots round, smooth, red, $\frac{3}{4}''$ diameter, $^1/_3$ white at bottom.
Rhubarb:	
*Victoria..................	Vigorous with upstanding thick red stalks. Summer variety.
Crimson Winter...........	Similar to above except that the stalks are usually thinner. Very early variety, therefore suitable winter variety in warmer parts.
Spinach:	
Monstrous Viroflay........	An old variety with long broad, darkgreen pointed smooth thick leaves. Variety variable in S.A. Improved strains like Giant Nobel and Tempo sold as Viroflay.
Squash, Marrows:	
Long White Bush Marrow.	Fruits cylindrical, somewhat larger at blossom-end and light green white, 18″ long, inclined to produce trailing types.
Long Green Bush Marrow..	Like above, only fruits are green.
Green Hubbard Squash....	Fruits pointed at both ends, slightly warted, darkgreen in colour, orange-yellow flesh.
Y llow Hubbard Squash	
Little Gem Squash........	Almost globular, darkgreen, very slightly marked, 3–4″ diameter.
White Bush Scallop Squash	Very old variety, fruits pale green, cream white, shaped like pie with lobed edge.
Tabl Qu n.	
Tomato:	
Marvel....................	Fruits lightly flattened, globe shaped, firm fleshed, tough skin, travels well, wilt resistant, inclined to run to small sized.
Marglobe................	Fruits medium large nearly round with thick walls and cross-sections, solid, flesh red.
Bonny Best..............	Fruit slightly flattened, globe shaped, medium size, red, solid flesh.
Norton....................	Fruits flattened, globe shaped, red, solid flesh, to some extent resistant to fusarium wilt.
*San Marzano, Kin Haml t	Small fruited variety, fruits often rectangular, 2-celled borne in clusters, deep-red with little juice, suitable canning variety.
Sunrise....................	Round, smooth, medium-sized, uniform in shape, stands transportation well.
*P arson.	
*Rut ers.	
Turnips:	
Purpletop White Globe....	Tops darkgreen, large cut leaves, roots large, globe-shaped, upper part purple red, white below. Inclined to vary in shape of root, diameter 2–3″.
Watermelon:	
Tom Watson.............	Fruits large, uniform, cylindrical, oblong, deepgreen, veined, tough rind, flesh deep red, seed brown.
Cape Mountain...........	Fruits long, bright green, with dark irregular stripes, flesh red, seed red-brown.
Wonder.	
Ice Cr am	

* Suitable for canning. † Suitable for dehydration

 [Continued on page 265.

General Principles of Vegetable-seed Production

H. van Elden, Horticulturist, Pretoria.

THE production of good vegetable seed requires more attention to detail than is ordinarily required for the cultivation of fresh vegetables.

The land should be well prepared beforehand, ploughed, harrowed, levelled and fertilized to suit the individual needs of the crops to be grown for seed. Where the crops have to be transplanted as in the case of beet, cabbage, carrots, cauliflower, eggplant, leek onion, parsnip and tomato, the seedbeds should be made level and the seed drilled in in rows according to the correct espacement for the particular crop. This is not only necessary to prevent wastage of seed and to facilitate weeding, but will also ensure that all plants will have a reasonable chance to develop normally and so reduce to a minimum the amount of culling of off-types and mishapen plants. At the outset it is desirable to obtain the best possible quality seed in order to avoid disappointment at a later stage, when culling may cause the removal of a larger proportion of plants than normally would be necessary, and yet there may be doubt as to whether or not the ultimate seed crop could really be guaranteed quality seed.

Sufficient Plant Material.

It is also advisable to plant a little more than is actually required, so as to be certain of having sufficient plant material to select from. Depending on the quality of the original seedstock and the nature of the vegetable, the extent to which culling will be necessary may be anything from 10 to 100 per cent. Where seed production is undertaken on a large scale, a succession of sowings is desirable to overcome, as far as possible, crop failures due to weather conditions, diseases, or insect pests, and further to distribute the work connected with selection, grading, and planting more equitably.

For each vegetable crop the danger of cross-pollination taking place between varieties of the same kind of vegetable, related vegetables and related weeds, may be great. Beans, eggplant, endive, lettuce, capsicums, peas, and tomatoes are usually self-pollinating. Cross-pollination may occur, but this never amounts to more than 5 per cent., which for practical purposes may be ignored. As a safeguard, however, it is recommended to have the varieties separated some distance from one another. Cucurbits (i.e., pumpkin, squash, cucumber), also carrots, parsnips and celery are self-fertile, nevertheless it may often happen, under natural conditions, that cross-pollination occurs, especially with the wild forms which occur naturally as weeds.

Asparagus, beet, broccoli, cabbage, cauliflower, kohlrabi, onion, radish, spinach, are naturally cross-pollinating. Any plantings made of these easily cross-pollinating or naturally cross-pollinated vegetable types must be widely separated (at least one mile), in order to prevent cross-pollination. Alternatively, other precautions, such as planting the varieties at different dates so that the flowering periods will not coincide, must be taken to eliminate cross-pollination taking place between varieties of the same kind of vegetable (such as Marrow, Long Green, and Marrow, White Bush), and between vegetables of the same family, such as Hubbard Squash and Boer Pumpkin, or with related weeds that may occur among the culti-

vated crop; for example, crossing a wild cucumber with edible varieties of cucumber may be extensive.

Culling.

A study should be made of the varietal characteristics of the vegetable varieties grown; the plants should be classified and graded according to the standards set for the variety, with retention only of those plants that come nearest to the ideal. The best time to select and cull is when the crop is in prime condition for fresh consumption. In the case of transplanted crops the severest culling should take place at the time of transplanting, when it can be most economically done, the culls either being fed direct to farm stock or sorted and graded for disposal on the local market. A further culling or rogueing will be necessary when the crop comes into flower to remove the early flowering, "bolting" types, and diseased plants. This field culling will usually be light, not exceeding 10 per cent., provided the earlier culling was thoroughly carried out.

Crops which do not require transplanting should be gone over systematically when mature as fresh vegetables, examining each plant carefully to determine if it is true to variety, removing any off-types, or undesirable plants at that time. The lands should be kept free of weeds at all times to reduce the possibility of attacks by insect pests and diseases, thus ensuring a healthy crop of good quality seed.

Seedheads can be harvested as soon as the fruits or seedpods are mature. To prevent shattering, common in some instances, it may be advisable to harvest the seedheads as soon as they start to ripen and turn a brown colour.

Gathering of Seed.

The seedheads collected are allowed to cure and become thoroughly dry on specially constructed drying floors, on sails, or in barns. When dry, they can be threshed by threshing machines or other means. For beans and peas suitable handpower threshers are obtainable. In the case of the small-seeded crops, like cabbage or endive, a hammermill, driven at a slow speed, can be used effectively. For carrots and crops with similar seedheads, where difficulty is experienced in separating small seed-stalks from the equally light seed, the seedheads can be heaped up 12 to 18 inches deep on a drying floor and rolled with a light garden roller until the seed separates from the stalks.

After removing the coarse trash with a medium mesh sieve, the separated seed and chaff may be passed through finer sieves or a light winnowing machine similar to that used for separating wheat or lucerne. The speed of the rocking sieves, air blast, and baffle plates will need to be adjusted according to the type of seed to be cleaned.

Seed of pumpkin, muskmelon, watermelon and the like are scooped from the fruit, dried rapidly in the sun and then brushed on a sieve to remove the excess pieces of dry fruit-flesh and fine membraneous tissue adhering to the seed. Seed of badly decayed fruits should not be used, as the colour of such seed is poor. The seed of certain types of squash are particularly susceptible to discoloration when allowed to remain in contact with the fermenting material, and and special care should be taken to avoid this.

To extract the seed of soft, fleshy fruits like tomato, eggfruit and cucumber, the ripe fruits are cut open and the seed scooped out, or where this is not possible, merely mashed, then placed in a barrel or drum to ferment. To hasten fermentation, the pulp should be

stirred with a wooden pole from time to time. Allow the mass to stand for a few days until the fruit pulp separates easily from the seed. The seed is then washed and cleaned through a sieve to remove all fruit flesh. The seed is then spread out in thin layers on sacking or other suitable material and placed in the sun to dry. The fermentation process should be of the shortest possible duration. The seed should be washed immediately in clear water and dried rapidly to prevent discoloration. Tomatoes are usually fermented for only two days, while cucumbers can safely be left for four or five days.

As the appearance of seed plays such an important part, it is advisable to pay particular attention thereto. The large-seeded vegetables such as beans and peas should be sorted by hand, removing all discoloured and defective seed. Light seed in onion and leek can be removed by submersion in water and skimming off all those seeds that float.

A Vegetable-seed Industry for the Union :—

[*Continued from page* 262.

Testing of Seed.

Felid trials have also shown the necessity of limiting the varieties of the different vegetables to those with outstanding qualities suitable for planting over the widest possible area of the country. Where formerly great variability existed in samples of the same variety, in some instances wrongly named, it has been possible to bring about some improvement by fixing standards for the varieties. By insisting on more careful selection by growers according to these standards and by building up local stocks of pedigree seed of the more desirable strains selected from the best specimens in the tests for seed production, it should be possible within a comparatively short period to raise the standard of South African vegetable seed.

Every vegetable seedgrower will doubtless be concerned about the future of the industry after the present war, when seed can again be imported. Results indicate that certain vegetable seeds can be produced in South Africa. Nevertheless, it is essential, if the industry is to develop, to give particular attention to reduced cost of production to be able to compete in the world markets. In this connection the organisation of all farm operations, to the same degree of efficiency as the production line of a factory, requires special attention. Much can still be done by the use of machinery to expedite many of those operations which can be done more efficiently by mechanical means, such as the threshing, winnowing, grading and cleaning of seed.

Furthermore, seed production should be limited to those crops that can be grown to perfection at the lowest possible cost, by concentrating on and standardising particular varieties and establishing a uniform standard of quality.

Production of Pasture-crop Seed :— [*Continued from page* 250.

sure that they start off with seed of superior quality. The necessary tests will be carried out by the Division of Soil and Veld Conservation if representative samples are submitted.

The Department is prepared, furthermore, to purchase the seed of any superior indigenous veld grasses from farmers, who collect it from pure stands in the veld or who grow it for seed-production purposes.

Sowing Chart for Vegetable-seed Production.

Vegetable Crop.	Germ Percentage of Seed.	Lifetime of Seed in Years.	Average Amount of Seed per oz.	Leave or Transplant.	Distance between Rows, in Inches.	Distance between Plants, in Inches.	Average Amount of Plants, per Acre.	Relation between Crop and Seed of Crop.	Yield Seed in lb. per Acre.	Weight of Seed per Grain Bag.
Aspergus seed	90	3	1,000	—	—	—	—	—	900–1,250	203
Aspergus roots	—	—	—	S	36–72	24	3,000–7,000	—	—	—
Beans (dwarf)	90	3	100	L	18	6	50,000	Seed: Yield 1: 20 lb.	1,000–1,500	190
Beans (runner)	90	3	100	L	36	24	7,000 stakes	Seed: Yield: 1–20—1–25	1,000–2,000	190
Beet	80	4	1,750	T	36	24–36	4,000–7,000	1–15–20 Surface planted	1,000–2,000	65
Brussel Sprouts	85	4	6,500	T	48	36	3,000	—	—	153
Cabbage	85	4	5,000	T	36	24	7,000	20–25 plants yield 1 lb. seed	300–500	153
Carrots (yellow)	75	3	14,000	T	36	24–36	4,000–7,000	1–15–20 area planted	500–1,000	78
Cauliflower	75	4	14,000	—	48	36	3,000	1,000 plants yields 70 lb. seed	150–500	153
Celery	80	3	100,000	T	36–48	6–12	10,000–20,000	—	—	103
Cucumber	85	5	1,000	L	60	48	2,000	—	300	115
Eggplant	75	4	5,000	T	30–48	24–36	3,000–7,000	—	—	115
Kohlrabi	85	3	7,000	TL	36–48	12–24	5,000–14,000	—	200–400	153
Leek	80	2	8,000	L	18–24	6	40,000–50,000	12 plants, 1 lb. seed	300	—
Lettuce	90	6	16,000	TL	20–24	15	17,000–20,000	50–100 plant yield 1 lb. seed	200–400	90
Muskmelon	90	5	1,200	L	48	48	2,500	8–10 fruit, 1 lb. seed	—	78
Onion	80	2	12,500	T	36–42	12–18	8,000–14,000	1 bag bulbs, 30–35 lb. seed	300–500	103
Parsnip	75	1	2,800	T	48	24	5,000	—	500–1,000	65
Parsley	70	1	17,500	L	36	12	14,000	—	1,000	78
Peas	90	3	50–150	L	24–36	3	5,000–8,000	Seed: Yield 1–20 lb.	1,000–1,500	190
Pepper	75	2	4,000	T	30–36	18–24	7,000–11,000	—	—	103
Potato (sweet)	—	—	—	—	—	—	—	—	—	—
Pumpkin	90	4	100	L	120	120	400	4–8 Fruit, 1 lb. seed	375–500	65
Radish	90	4	5,000	T	36	10–12	14,000–17,000	50–100 plants yield 1 lb. seed	300–500	153
Rhubarb (roots)	—	—	—	—	36–72	24–36	2,000–7,000	—	—	—
Rhubarb (seed)	—	—	—	—	36–72	24–36	—	—	—	—
Salsify	75	1	4,500	LT	30–36	8–10	15,000–25,000	100 plants, 1 lb. seed	125–250	78
Spinach	80	3	3,000	L	24	6	40,000	—	250–500	90
Spinach (beet)	80	4	1,750	L	48	24	5,000	10 Plants yield 1 lb. seed	500–2,000	—
Squash Marrows	90	4	—	L	36–120	36–120	435–5,000	—	200–400	60–80
Tomato	85	3	7,500	LT	36	48	3,000	1,000 fruit, 4 lb. seed	60–120	65
Turnip	90	4	10,000	T	36	12–15	11,000–14,000	50–100 plants yield 1 lb. seed	150–500	153
Watermelon	85	—	225	L	120	120	435	8–16 fruit, 1 lb. seed	150–400	103

N.B.—"S" means sow. "L" means leave, and "T" transplant. Root and Leaf crops planted for seed are usually sown in the fall so that the crops can mature before winter, undergo a rest period and be transplanted after the winter to produce seed. In the case of onions, radish and turnips, they are transplanted before winter, in order to allow the bulbs to establish themselves before cold weather sets in. (Division of Horticulture.)

The Production of Carrot Seed.

Dr. J. D. J. Hofmeyr, Agricultural Research Institute, and H. van Elden, Division of Horticulture.

COMPLAINTS have been received from various quarters to the effect that carrot seed produced in South Africa is inferior to imported seed, owing to the number of bolters produced. Since this creates a serious problem under the present circumstances when South Africa is mainly dependent on its own resources for the supply of seed, the matter was investigated experimentally on the University Experiment Farm, Pretoria.

The locally produced Chantenay seed, namely, Nos, 1, 4, 9 and 10 (see Table) are samples of the seed which gave rise to the above complaints. According to information furnished by officers of the

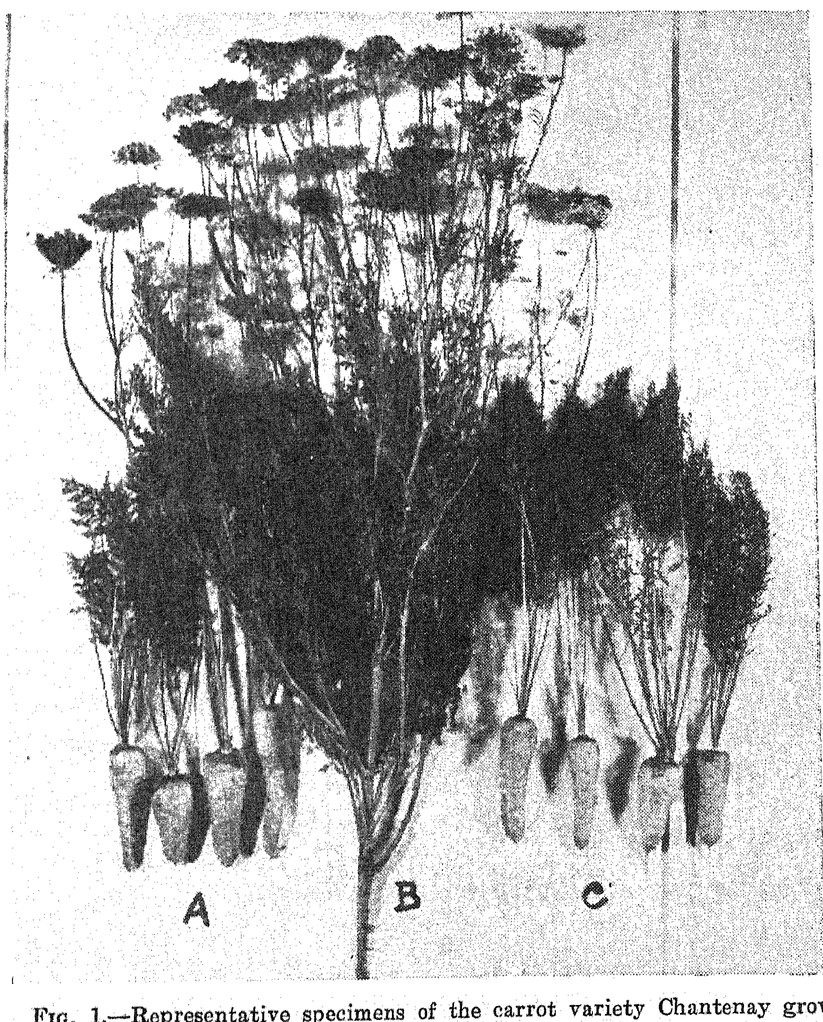

Fig. 1.—Representative specimens of the carrot variety Chantenay grown from :—

(A) Imported seed from No. 6;
(B) locally produced seed from Nos. 1, 4, 9, 10; and
(C) locally produced seed from Nos. 2 and 11.

Wheat breeding experiments at the College of Agriculture, Potchefstroom.

Division of Horticulture, it appears that the methods of selection used in the production of this seed, leave much to be desired. On the other hand, Nos. 2 and 11 are samples of this variety obtained from farmers who applied the desired methods of seed selection; No. 6 is pre-war imported Chantenay seed.

Methods of Selection.

What do we understand under good and bad methods of seed selection? The recognised method is to sow the carrot seed in rows from January to March in the usual way, and then to thin out the plants later on in order to give the roots sufficient room for development. As soon as the carrots are full-grown, i.e., after the winter, they are lifted, and those with the desired size, quality, etc., which are typical of the variety, are selected, while those with undesirable qualities are rejected. The selected carrots are than transplanted in rows with a spacing of 3 feet by 3 feet, and allowed to run to seed.

Some farmer do not transplant the carrots for seed production, however, but are inclined to market the best carrots, those which are left over being allowed to run to seed. This procedure will inevitably result in the seed of plants with a tendency to bolt being mixed with the seed of other plants, and eventually such seed will constitute a considerable percentage of the latter. The tendency to bolt is probably hereditary, and this accounts for the high percentage of such plants in Nos. 1, 4, 9 and 11 (see Table). Apart from this, however, it is most desirable that carrots should be lifted and transplanted, since only in this way can characteristics, like form, size, etc., be determined.

Experiments Carried Out.

The experiment was laid out according to the randomized block system. Carrot seed from 12 different sources was tested in separate rows each 24 feet long and 18 inches apart, replicated five times. After thinning out, the final spacing of the plants was 3 inches in the rows. The seed was sown on 5 May, 1943, and the plants were lifted during the following October, and divided into two classes, those which had run to seed, and those which had not. Since the complaints received mainly concerned the Chantenay variety, most attention was paid to the seed of this variety, but seed of the varieties

Percentage of Bolters in Carrot Varieties obtained from Different Sources.

Source.	Replications.					Average
	I.	II.	III.	IV.	V.	
Chantenay — 6 (imported)...	0·0	0·0	0·0	1·7	0·0	0·2
Chantenay — 1 (local).......	37·9	50·0	64·9	27·4	48·4	45·4
Chantenay — 2 (local).......	2·6	1·5	2·3	3·3	1·7	2·2
Chantenay — 4 (local).......	80·0	92·1	83·3	78·0	94·7	85·6
Chantenay — 9 (local).......	57·6	79·4	70·4	51·6	82·0	70·0
Chantenay —10 (local).......	57·3	78·1	43·0	92·5	92·4	72·7
Chantenay —11 (local).......	2·0	2·1	0·0	1·8	0·0	1·2
Nantes —12 (imported)...	0·0	2·7	2·0	0·0	2·7	1·5
Nantes — 8 (local).......	0·0	0·0	0·0	2·4	2·2	0·9
Danvers — 3 (imported)...	0·0	0·9	1·0	1·7	0·0	0·7
Cape Nantes — 5 (local).......	6·3	1·8	1·0	1·0	4·6	2·9
Oxheart — 7 (imported)...	0·0	0·0	0·0	0·0	0·0	0·0

Minimum significant difference between averages with $\left.\begin{matrix} P = 0·05 = 11·2\%. \\ P = 0·01 = 14·9\%. \end{matrix}\right.$

 [Continued on page 278.

Prevent Seed Wastage.

H. B. Terry, Horticulturist, Division of Horticulture, Pretoria.

UNDER present-day world conditions seed of vegetables and garden flowers is difficult to obtain; importation is practically impossible, local seed production is in its infancy and control measures have been instituted to ensure that the Union has sufficient for its population, and to prevent waste of vegetable seeds generally. To the average individual the sowing of a few packets of seeds could not possibly affect the seed stocks in the country, but when these few packets are multiplied by thousands, many pounds of precious seed are involved, and unless practical methods are adopted before and after sowing, considerable wastage occurs.

The essentials of successful vegetable production and the elimination of waste begin with the purchasing of good seed of varieties suited to local conditions and known to have a high percentage of germinating power. The second important point is to make certain that each kind of vegetable is sown at the correct time to enable the plants to produce the maximum yield, since plants bolting to seed before they can be used are a complete waste. Good seed sown at the correct time can only yield maximum crops when the soil in which the plants are to grow has been brought to a high degree of fertility. More plant food is removed from the soil by vegetables than by most agricultural crops. Good growth and well proportioned vegetables can only be expected where there is depth of soil, a sufficient and steady supply of plant food, provided by the addition of liberal quantities of manure and fertilizers, throughout the growing period.

Sow Seeds Thinly.

In the aggregate a large quantity of seed is lost because growers sow too thickly; this is false economy, since it involves the early thinning out of seedlings to enable others to develop into useable plants; light is as essential for development as correct spacing—and here a warning may be given not to expect vegetables to produce their best when grown too close to fruit trees where shade is dense and the roots of trees remove plant food and water. Once the young seedlings are through the ground, cultivation between the rows, thinning out, weeding and the control of insect pests and disease are necessary if the crop is to be brought to maturity. Frequent stirring of the soil by hoeing controls weeds, prevents formation of soil crusts, aerates the soil by permitting essential supplies of oxygen to penetrate and stimulate the activities of bacteria in the soil, and allows water to reach the roots instead of running off. It is not possible, owing to the competition for plant food, to produce a crop of weeds and vegetables in the same space. Watering is an essential phase of cultivation and requires thoughtful application. Generally, too much water is given without regard to the condition of the soil below the surface; if the soil is found to be moist at a depth of 2 to 3 inches deep no water will be necessary as too much water prevents normal root activities, lowers soil temperatures and washes out essential plant foods; by regulating water, wastage can be reduced. In connection with flower seeds the need for elimination of waste is of greater importance. Many kinds are difficult to obtain since vegetable seeds are given shipping preference over flower seeds. Local growing of flower seeds is being fostered wherever possible, particularly those of a bulky nature and those generally grown for cutflowers. Wastage of seed can be considerably reduced if, wherever possible, flower seeds are sown thinly in seed tins or seed beds for transplanting later where they are to flower.

The use of moisture-proof bags is recommended where seed is kept in a warm, humid climate, or is to be sent by ocean transport.

It is highly desirable that moisture determinations be made on seed sent to or through humid localities, as a moisture content considered safe in a relatively dry or cool area may sometimes be dangerous in a warmer or moister atmosphere, especially where extra moisture is taken up by the seed.

Control of Insects in Stored Seed.

Seeds are subject to insect damage from the time they mature in the field until they are sown. While one group of insects feeds and completes its life-cycle within the seed, another feeds almost exclusively on the germs.

Those of the first group confine their attacks either to cereal seeds, like the rice or maize, and granary weevils and the *Angoumois* grain moth, or to seeds of legumes like the pea, bean, and cowpea bruchids (weevils) and the small wasp-like chalcid of lucerne seed. Most of them are capable of flying to growing crops to cause preharvest infestation of seed. It is obvious that their presence in seeds cannot be detected until they emerge as adults. This takes place about one month after the laying of the eggs from which they have been hatched. Unless their germs have also been destroyed, the germination capacity of seed in which insects have developed is not impaired, but the seedlings produced are generally weak and handicapped on account of the lack of a normal food supply. Pea seeds in which only a single bruchid has completed its development are generally worthless for planting purposes. In other countries the lucerne chalcid often renders seed production unprofitable, but in the Union it fortunately does not often appear in appreciable numbers in the lucerne-seed producing areas.

To the germ-destroying group belong the larvae of the Indian meal moth and the large shiny black beetle called the Cadelle. They confine their attacks almost entirely to seeds kept in stores, bins and elevators. Though useless for planting, the seed damaged by them is generally fit for milling.

Conditions Favouring Insect Development.

Whatever group they may belong to, seed-destroying insects develop most rapidly under warm moist atmospheric conditions and when well supplied with food, especially in the form of loose-lying and broken seed. Their most favourable conditions are temperatures from 80-90° F. and a seed moisture content of over 14 per cent. Both freezing and temperatures from 120-140° F. are fatal to this class of insect. In dry seed their development is slow and it has been shown that when a moisture content of 8 per cent. is reached insect development ceases.

Safeguarding Seed against Insect Attack.

Seed can be safeguarded from insect infestation by:

(1) producing seed in areas with climatic conditions unfavourable for seed-infesting insects;

(2) by the use of fumigants, dusts and heat treatment; and

(3) good store management and reducing the sources of infestation.

(1) Pea-seed production is rendered almost impossible in the south-western districts of the Cape Province on account of infestations by bruchids, while it is far more successfully undertaken in

the dry areas of the lower Orange-River Settlements at Upington and Kakamas. In the cool Koue Bokkeveld (Ceres) area Painted Lady (Lappies) beans are generally free from bruchids, but when kept at Potchefstroom they become heavily infested. Other varieties of beans may in all probability remain free from this pest in the Koue Bokkeveld. Seed is liable to be infested the whole year round in the hot moist lowveld of the northern Transvaal. During the dry winter months the storage of maize seed presents less of a problem than the keeping of wheat over the rainy summer months.

(2) *Seed Treatment*: (*a*) *Fumigation*.—As a precautionary measure, seed suspected of infestation may be fumigated with either carbon bisulphide, ethylene dichloride or commercial petrol. The germination capacity of seed will not be effected by fumigants, provided it is thoroughly dry, but moist seed may be damaged considerably. For fumigation to be most effective the temperature in the fumigation chamber, drum or vessel should not be below 70° F. during the greater part of the day. In addition, the containers or rooms should be absolutely gas-tight. The dosages and duration of fumigation may be as follows per bag of seed or per 4¼ cubic ft. of space, viz., carbon bisulphide 2 to 3 tablespoonfuls for 48 hours, commercial petrol 3 to 4 tablespoonfuls, and fumigate for 96 to 120 hours.

Small quantities of seed may be very effectively fumigated in well-made, perfectly air-tight jars or drums by the introduction of a few drops of carbon bisulphide.

(*b*) *Dusts*.—As fumigation will not prevent reinfestation, inert or poisonous dusts may be used to keep seed free from insects. Finely powdered white lime, as well as copper carbonate, has been found most effective for this purpose. Though white lime does not give complete protection against bruchids in beans, it nevertheless reduces destruction to a marked degree. Powdered white lime may be applied at the rate of 1 to 2 lb. per 100 lb. of seed, and copper carbonate (a poisonous compound) at the rate of 3 to 6 ounces per 100 lb. of seed. Their insecticidal efficiency depends on their fineness, a low moisture content in the seed and the thoroughness of covering the seed when mixing takes place. Powders will not destroy immature weevils still inside the seed. It is essential, therefore, that seed be fumigated before they are treated with the powder.

(*c*) *Heat Treatment*.—Heat, carefully applied, destroys insects in all their different stages of development without harming the germination capacity of seeds. The seed should be spread out in thin layers and be subjected for three to four hours to temperatures between 120° to 140° F. The duration of the treatment will depend largely on the intensity of the heat applied. The heat of the sun is effective on seed spread out in very thin layers during dry hot weather.

(3) Seed is not safe against insects in stores *containing infested grain* and milled animal feed, or where broken grain and meal litter the floors and corners. Such places provide sources of infestation even for seeds maturing in the field. Light infestations may be brought under control by spraying walls, floors and ceilings, but a general fumigation will be essential when the contamination is widespread.

The Disinfection and Protection of Seed.

Dr. J. E. van der Plank, Division of Botany and Plant Pathology.

IN 1807 Bénédict Prévost found that by treating seed with compounds of copper, wheat could be grown which was free from stinking smut, then one of the main causes of famine in France. At this point started the real history of the chemical treatment of seed against disease. Progress was slow at first, but the past 50 years, particularly the past 20 years, have seen the development of an important array of chemicals which it is the purpose of this article to discuss. Four groups of chemicals need special mention:—

1. *The copper group.*—Copper sulphate (blue-stone) was first used. Solutions were prepared in water, and the seed steeped in them. Treatment with liquid in this way is tedious, and the copper sulphate is prone to injure seed. A great advance was to mix seed with dry, finely-divided copper compounds in the form of dusts. Copper carbonate is the best known of these, although others, basic copper sulphate, cuprous oxide, etc., are also good.

2. *Formalin.*—The wetting of the grain with formalin was introduced at the end of last century. Later, the dry spray method was discovered; it removed one of the objections to using formalin, viz., the wetting of the grain.

3. *Organic mercury compounds.*—Mercuric chloride (corrosive sublimate) has long been known to disinfect seed, and is still used in some cases, e.g., against scab in potatoes or black rot in cabbages. But mercury is now applied mainly in the form of organic mercury compounds. Several of these are on the market under trade names. Dusts, under the names of Abavit B, Agrosan G, Ceresan, Harvesan, etc. are used for mixing dry with seeds; other compounds like Aretan are dissolved in water and used for soaking bulbs and tubers. These organic mercury compounds are one of the major contributions of chemical industry to agriculture, and some are almost incredibly efficient. A little mercury, no bigger in size than a pea, when combined in the form of a suitable organic compound, diluted with talc or other filler, and dusted on the seed, will protect 20 morgen of wheat, oats or barley against seed-borne disease.

4. *New non-metallic compounds.*—In recent years, and especially under the stimulus of war-time shortage of metals, there have been developed potent disinfectants which contain neither mercury nor copper. "Spergon" is the trade name of a long-known substance, chloranil, which has only recently been found to have great prospects in seed-treatment. Arasan, the first three letters of which are those of *Arachis*, the Latin name for groundnut, has recently been developed in the United States for treating groundnut seed, but has not yet reached South Africa.

Seed Disinfection and Protection.

The first use to which chemicals were put was to remove infection carried by the seed itself. Copper sulphate, for example controlled stinking smut by killing the spores of this fungus which were lodged on the seed. Such a process is known as *seed-disinfection*. All the chemicals named above are disinfectants to some extent or other. But there is another use of seed-treatment, and that is the protection of the seed or the young emerging seedling against diseases carried in the soil. This is called *seed-protection*. For example, groundnut

seed which carries no serious infection of its own is liable to rot if planted in soil which is too cold and wet, or the young groundnut seedling may be attacked by fungi from the soil before it emerges. Protection against this can be afforded by several chemicals applied to the seed before planting.

The distinction between disinfection and protection is important. Formalin is a good disinfectant, but is useless as a protectant. Copper compounds are good disinfectants, but their value as protectants is variable. The organic mercury compounds and the new non-metallic compounds are often excellent both as disinfectants and as protectants.

Treatment of Crops.

The following may serve as a guide in the choice of treatment for some of the more important crops.

Wheat.—Formalin is effective against smut, but frequently retards germination and reduces emergence, stand and yield, especially when sowing is delayed after treatment, or when the soil is too dry for immediate germination. It gives no protection against soil-borne diseases; on the contrary, the delayed emergence which often follows its use, gives soil diseases increased opportunity to attack the seed or seedling. It has no virtues not possessed to an equal or greater degree by other chemicals, and there is no valuable purpose in its continued use in some districts.

Steeping in solutions of blue-stone (copper sulphate) is often dangerous to seed and has outlived its usefulness. Treatment with dry copper carbonate is safe and effective against stinking smut and flag smut, and gives some protection against soil-borne fungi. So far as smut-control is concerned, the choice between copper carbonate and organic mercury compounds depends on price. The dosage for copper carbonate is about 7 oz. per bag. Treated seed can be stored without harm.

The organic mercury compounds are effective against stinking smut and flag smut. Apart from this, many workers have found an increased stand, increased vigour of the young plants and increased yield which cannot be attributed simply to the control of smut, but seems to be a matter of seed- and seedling-protection, especially in soils heavily infected with the foot-rot fungi. The dosage for the various proprietary brands is stated on the packages, and is also summarised at the end of this article. In general, seed treated with the full dosage should not be stored for a long time because of the possibility of injury. In the United States, where brands are somewhat different from those in this country and dosages are far lower, the recommendations are ½ oz. per bushel (slightly over 1½ oz. per bag of 200 lb.) for seed to be sown immediately, but ¼ oz. per bushel of seed to be stored for 2 weeks or more. There is no loss of efficiency in this reduction: the extra time of contact between seed and disinfectant compensates for the lower dosage.

(Note that no known chemical will control loose smut, against which a rather tedious treatment with hot water is the only measure; nor will any known chemical give protection against foot- or root-rot in the adult stages of the plant.)

Oats.—For comments on formalin, see under Wheat. Copper carbonate is an effective disinfectant only with hull-less varieties. The organic mercury compounds effectively control both loose and covered smut in hulled types as well as hull-less. Information on the protective action of these compounds and matter of dosage is given under Wheat, and also at the end of this article.

Barley.—The organic mercury compounds were the first to give adequate control of the seed-borne leaf-stripe diseases, and are most effective against covered smut. For dosage see the same reference given for oats.

No chemical agents are effective against loose smut, or foot-rot of adult plants. (See under Wheat.)

Maize.—There is no evidence that clean seed planted in warm soil needs treatment. In cold soils, with a temperature of about 55° F. or less, maize germinates poorly and the slowly-emerging seedling is subject to attack by soil-borne diseases. It, therefore, needs protection, a point of significance in connexion with early plantings in the cooler districts or in areas liable to cold, wet weather at sowing time. Infected seed, too, is benefited and, although the best principle is to use clean seed, treatment should be given in cases of doubt.

The organic mercury compounds are probably still without rival for treating maize.

Potatoes.—Potatoes cannot be treated against the more important seed-borne diseases: the degeneration diseases and bacterial wilt; but two diseases, scab and *Rhizoctonia*, respond to application of mercury disinfectants. Mercuric chloride (corrosive sublimate) can be used by the method described further on. It is, however, simpler and quicker to use Aretan.

Groundnuts.—Groundnuts need a warm soil for germination. If the soil is cool the seed germinates slowly and is inclined to rot. Protection can be given by applying chemicals to the seed before planting. Work done by the plant pathologist at Nelspruit has shown that the standard mercury compounds are effective. The dosage is given further on. "Spergon" is also very effective. The new protectant, Aresan, which is claimed to be specially adapted for the treatment of groundnuts, has not been available for trial.

The use of seed protectants is especially valuable in the case of groundnuts. The good stand which only protectants can ensure is a necessity not only for high yields, but also to ward off rosette disease, which is largely a disease of poor stands and broken rows.

There is no evidence that protectants will prevent nut rot (caused by *Sclerotium Rolfsii*) from attacking a crop grown in infected soils, but at least they might be used to keep the disease from being carried on infected seed into new, uninfected lands. There is likewise absolutely no evidence that continued seed treatment lowers the resistance of the crop to nut rot (as has occasionally been rumoured).

Peas.—Untreated pea seed germinates poorly in soil that is too warm, because at high temperatures the seed or the young seedling is attacked by diseases which rot it in the ground. Treatment of the seed before planting gives protection, and the results obtained by the plant pathologist at Nelspruit suggest that the planting time in the Lowveld can be advanced several weeks by treatment, a finding that should appreciably lengthen the season in that area. Spergon, used at the rate of 4 oz. per 100 lb. of seed, gave excellent results, but it is possible that other protectants are also valuable and should be tried. Organic mercury dressings (Abavit B, Agrosan G, Ceresan, Harvesan), at the same rate of about 4 oz. per 100 lb., have been recommended elsewhere, and are worth trying because they are so easy to obtain.

Tobacco.—A treatment which was recently developed is to add 0·25 per cent. of Spergon to tobacco seed (i.e., 1 oz. of Spergon to 25 lb. of seed) and shake thoroughly. Within a week all fungi and

bacteria on the seed are killed, but the seed itself is unaffected and can safely be stored for long periods.

Use of Organic Mercury Dressings.

The organic mercury dressings on the South African market are *Abavit B*, *Agrosan G*, *Ceresan*, and *Harvesan*. The amount recommended by the distributors for use per bag of seed and the diseases they control are summarized in the following table:—

Crop.	Diseases Controlled.	Amount of Dressing per Bag of Seed.			
		Abavit B.	Agrosan G.	Ceresan.	Harvesan.
		Oz.	Oz.	Oz.	Oz.
Wheat........	Stinking smut, flag smut	6	6	5	6
Oats..........	Loose and covered smut	10	10	6	10
Barley........	Covered smut, leaf-stripe disease..............	7	10	5	8
Maize........	Seedling blight. Poor emergence in cold soil	7	6	5	6
Kaffir corn....	Smut..................	—	6–8	6	8
Groundnuts...	Damping-off. Poor emergence)...............	—	6	5	6

Application of Dry-Seed Dressings.

It is necessary that dry seed dressings (organic mercury dressings, copper carbonate, Spergon, etc.), should be applied so that each seed is coated. Mixing in the dressing by adding it to a heap of seed on a cement floor and repeatedly turning it in with a shovel is not the most satisfactory way, although it may be used for small quantities. Proper mixing machines are much better and can be home-made. A barrel, old oil drum, solidly built box or other container with a tight-fitting lid is fitted with an axle (¾ inch piping is useful for this) and supported on strong uprights. The container, which must be absolutely dry, is then about two-thirds filled with seed, and the dressing added. The whole is then rotated until the contents are mixed.

Mercury dusts are poisonous. Avoid working in air saturated with them.

Hot-water Treatment for Loose Smut of Wheat and Barley.—Loose-smut infection of wheat and barley is seated deep in the grain, out of the way of disinfectants which can only act against diseases carried on the surface of the seed. The only treatment is with hot water between definite limits of temperature—water which is hot enough to kill the infection but not so hot as to kill the seed. The method is as follows:—

Fill bags about half-full of grain and soak in water at ordinary temperatures for 5 to 7 hours. Two vats of hot water are prepared and held at correct temperatures. A third vat containing cold water is also needed. Dip the seed, previously soaked for 5 to 7 hours, in the first hot vat, which should be at about 120° F. After one minute remove the seed into the second hot vat with a temperature of about 129° F. (the permissible extreme range being 124° to 131° F.). Keep it immersed there with occasional movement for 10 minutes, then transfer immediately to cold water.

This method—unfortunately the only method against loose smut—is so tedious and requires such exact control that it does not find much place in ordinary farming practice.

Treatment of Potatoes with Corrosive Sublimate (Mercuric Chloride) against Scab and Rhizoctonia.—Dissolve 4 oz. of corrosive sublimate in a little hot water (it dissolves very slowly in cold water), and then add enough cold water to make up to 25 gallons. The temperature of the solution should not be below 45° F. or above 70° F. Soak the seed for 1½ hours, remove it from the solution, and allow it to drain and dry thoroughly.

The solution may be used over again, provided that one adds ¼ oz. of corrosive sublimate for every bag which has been dipped to replace disinfectant which has been removed from solution. Water should also be added each time to bring the solution back to its original volume. Make up a fresh solution after four treatments.

Corrosive sublimate attacks metal and should only be used in wooden, enamel or concrete containers. It is also very poisonous.

The use of Aretan, which is a much simpler method, has been mentioned earlier under the heading Potatoes.

The Production of Carrot Seed:— [*Continued from page 268.*

Nantes (2 sources), Danvers, Cape Nantes and Oxheart was included in the experiment, in order to determine whether the tendency to bolt was also present in these varieties.

The table indicates the percentage of bolters in the 5 plots. A statistical analysis of the figures indicates that where the difference between any two averages is greater than 14·9 per cent., it is significant. A noticeably high percentage of bolters occurs in Nos. 1, 4, 9 and 10, which, therefore, shows that the complaints were well-founded. It will also be observed that Nos. 2 and 11, which came from farmers who applied the desired method of selection, produced on the average less than 3 per cent. of bolsters, and, therefore, show no significant difference in comparison with No. 6, i.e., imported seed.

Conclusions.

In so far as the other varieties mentioned in the table are concerned the tendency to bolt appears to be less pronounced than in the case of Chantenay. The available data are not sufficiently comprehensive, however, to allow of definite conclusions in this respect.

With reference to the illustration (Fig. 1), considerable variation occurs in the size and form of the carrots of both imported (A) and locally produced (C) Chantenay, which serves to indicate that stricter selection is necessary in order to ensure greater uniformity.

The results presented in this article prove beyond any doubt, that with careful selection, locally produced seed can be just as good as the imported article. On the other hand, the high percentage of bolters in the case of Nos. 1, 4, 9 and 10 is a serious warning against the pernicious methods of seed production practised by some vegetable-seed producers.

The Functions of the Seed-testing Station.

Legislatory Measures Affecting the Sale and Importation of Seed.

J. P. F. Sellschop, Professional Officer, College of Agriculture, Potchefstroom.

THE main functions of the Seed Testing Station at Potchefstroom are the making of routine purity analyses and germination tests, conducting of investigational work in connection with seeds, and administering the provisions of the Fertilizers, Farm Foods, Seeds and Pest Remedies Act, No. 21 of 1917, in so far as the Act relates to seeds. This Act provides for the promulgation of regulatory measures in respect of the labelling of seed declared as such by the Minister of Agriculture in the *Government Gazette*. Information regarding standards of purity and germination capacity given on containers of declared seed or on labels attached to containers of such seed, serves as a guarantee of the quality of the seed sold. Sellers of seed are responsible for the testing of the seed and the correctness of the information given on labels. Proclaimed seed is, however, subject to inspection at any place and time, and samples drawn by inspectors are submitted to the seed-testing station and analysed and tested according to prescribed methods. Persons guilty of a contravention of the provisions of the Act or in default in complying with its provisions are liable to prosecution.

Thus far only lucerne* seed has been proclaimed as seed in terms of the Seed Act. Other locally produced and imported seeds may become subject to it in the near future.

The Weeds Act, (No. 42 of 1937), provides regulatory measures restricting the importation and distribution of any seed with which the seed of any particular weed has become mixed. As the sale of lucerne seed containing dodder seed is prohibited (Government Notice 1383 of September 1937), lucerne seed is also examined for dodder seed in the course of inspections carried out in connection with the application of the provisions of the Fertilizers, Farm Foods, Seeds and Pest Remedies Act (Act No. 21 of 1917).

The importation of lucerne, maize, barley, cotton, tomato, oaks, chestnuts, elms, the tea plant and the burdock† weed seed is subject to the provisions of Agricultural Pests Act, No. 11 of 1911. The application of this Act is administered by the Division of Entomology.

Other work carried out at the seed-testing station consists of the testing of seed potatoes sold by seed-potato growers' associations controlled by the Department, and the building up of a herbarium of the seeds of economic plants and the weed seeds commonly found admixed with them.

The Station undertakes the testing of seed for both farmers and seed merchants. The size of the samples to be submitted and the methods to be followed in drawing samples for testing purposes are given below.

Rules for Seed Testing.

Seed testing has attained considerable significance with the passing of laws regulating the sale of seed in many countries. Hence

* See Government Notices Nos. 1578 and 1577 of August 27, 1943.
† *Arctium lappa.*

seed testing stations have been established all over the world, and the larger seed firms now provide facilities for the testing of seed on their own premises. As in the examination of fertilizers, foodstuffs and other materials usually subjected to analysis, samples must be fully representative for the accurate determination of the average purity and germination capacity of a particular lot of seed. It is essential, therefore, that definite rules be followed if comparable results are to be obtained. Uniform methods for the testing of a particular product are generally decided upon by an association specially interested in that product. In respect of seed the rules of International Seed Testing Association, the Association of Offical Seed Analysts of North America and those of the United States Department of Agriculture are generally followed. The methods prescribed by these three bodies are fundamentally the same. The following procedure is generally followed in regard to sampling.

Sampling: Equal amounts of seed are taken from at least five equally distributed parts of the quantity to be sampled. All the portions of equal uniformity are then combined in a composite sample, or more than one sample if great variations exist. From three bags and less approximately equal amounts of seed should be taken from near the top, middle and bottom of all the bags. In the same way at least every third bag should be sampled if there are more than three but less than 30, every fifth bag if there are more than 30 but less than a 100. No sample should represent more than 100 bags.

Size of Sample: Samples submitted for testing should preferably be of the following weights: (*a*) Tobacco, half an ounce; (*b*) Rhodes-grass seed, one ounce; (*c*) teff, rye grass, lucerne and rape seed, five ounces; (*d*) cereal, pea, bean seeds, 1 lb. to 1½ lb. If they are to be sent by post, samples should be placed in stout containers, preferably in cloth bags.

Commercial firms and private individuals interested in carrying out their own seed testing can obtain full particulars, regarding the equipment necessary and methods to be followed, from the Principal, College of Agriculture, Potchefstroom.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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* Price Review for February, 1944.

SLAUGHTER CATTLE.—In general, the quality of slaughter cattle on the markets was weak. On the Johannesburg market the offerings of medium and compound cattle were especially plentiful. The seasonal decline in cattle prices continued and were again somewhat lower than during the previous month, e.g., primes declined from 69s. 11d. per 100 lb. estimated dressed weight on the hoof in January to 68s. 11d. in February, good mediums from 66s. 2d. to 64s. 2d., mediums from 60s. 11d. to 56s. 2d. and compounds from 55s. 8d. to 48s. 5d. These prices were nevertheless considerably higher than during the corresponding month in last year. As a result of the strong demand on the Durban Market, maximum prices were realised for all grades, with the exception of undergrade beef. Supplies of first and second grade carcases predominate whereas supplies of National Mark supers were scarce. On the Cape Town market prices for primes declined from 82s. 10d. per 100 lb. estimated dressed weight on the hoof in January to 75s. 8d. in February; good mediums from 77s. 8d. to 70s. 10d. and mediums from 68s. to 62s. 6d. The demand for veal was weak throughout and prices declined.

Slaughter Sheep.—Prices of sheep declined slightly on the Johannesburg and Cape Town markets, while on the Durban market prices maintained the same level as during January and maximum prices were obtained throughout. On the Johannesburg market prime merinos were sold at 12·3d. per lb. estimated dressed weight as against 12·4d. for January, while medium merinos and prime cross-breds declined from 10·4d. to 10·3d. and 10·9d. to 9·6d. per lb. respectively. On the Cape Town market merinos declined from 12·1d. to 11·6d. and prime cross-breds from 12·0d. to 11·7d. per lb. Prices for prime lambs remained more or less on the same level as for the previous month.

Slaughter Pigs.—The supplies of slaughter pigs were fairly heavy on the Johannesburg market. A slight improvement was noticed in the demand, and prices showed a rising tendency. Prime baconers, however, declined slightly, e.g., from 7·3d. per lb. live

* Al prices mentioned are average.

weight for January to 7·2d. in February, whereas the prices for second grade baconers improved from 6·0d. to 6·1d.; prime porkers from 7·6d. to 7·7d. and second grade porkers from 6·3d. to 6·6d. On the Durban market prices declined, e.g., prime baconers from 8·7d. per lb. dressed weight for January to 8·5d; second grade baconers from 7·3d. to 7·2d.; prime porkers from 10·9d. to 10·8d. and second grade porkers from 9·1d. to 8·9d.

Grain and Hay.—Large quantities of Cape lucerne hay came on the Johannesburg and Cape Town markets. Although the demand was limited, better prices were realised on the Johannesburg market than in January, e.g., 5s. 2d. per 100 lb. as against 5s. in January. The demand on the Cape Town market was exceptionally heavy and 7s. per 100 lb. was realised for first grade lucerne. The supplies of oats were in general much smaller especially on the Durban market. On the Johannesburg market 5s. 6d. per 100 lb. was realised as against 4s. 7d. in January. A slight improvement was noticed in the supply of dry beans on the Johannesburg market and prices for all other beans, except for sugar beans, declined. The price of teff hay too, was lower on this market and the quality of the larger supply left much to be desired.

Potatoes.—As a result of the heavy rains in the Transvaal and parts of the Orange Free State, the supplies of potatoes were much smaller than in January. On the Cape Town and Durban markets an acute shortage was experienced and prices increased to a temporary extraordinary high level. On the Durban market prices as high as 48s. per bag were realised. The conditions on these markets, however, were again normal at the end of the month and prices declined so that the average price level was not much higher than that of the previous month. On the Johannesburg market, first grade No. 2 National Mark potatoes rose from 16s. 11d. to 17s. 11d. per bag. Other prices remained more or less on the same level as in January.

Onions.—The total supply in general was smaller than in January and prices increased on most markets. Supplies of Cape onions, however, increased on the Johannesburg market, and higher prices were realised than in January, e.g. 14s. per bag against 10s. 9d. in January. On the Cape Town market 7s. 10d. per bag was realised; 13s. 9d. on the Durban market and 13s. 3d. on the Pretoria market.

Tomatoes.—There was a slight increase in the supply in comparison with that of the previous month. As a result of the superfluous rains, temporary shortages were experienced, which caused prices to increase. National Mark No. 1 on the Johannesburg market averaged 4s. 7d. per tray compared with 4s. 3d. in January and ordinary tomatoes 1s. 9d. as against 1s. 6d. for January. On the Cape Town and Durban markets prices advanced from 2s. 2d. in January to 2s. 9d. and 1s. 2d. to 2s. 3d. per tray respectively.

Vegetables.—Apart from pumpkins, which were plentiful and generally cheap, practically all lines were scarce. Weather conditions were not only mainly responsible for the paucity of cabbages, beans and peas, but also for the large proportion of inferior parcels that arrived on the markets. Average prices were thus high as a result of this temporary shortage.

Fruit.—Peach supplies decreased and consisted mainly of yellow cling varieties. Deciduous fruit consignments were received mainly from the Deciduous Fruit Board. Supplies of grapes, apples and pears increased and prices declined. Offerings of grapes were especially heavy on the Durban market and large quantities arrived on

this market in a bad condition as a result of poor packing. As the supplies of deciduous fruit increased, prices of pines and bananas began to show a declining tendency. On the Johannesburg market heavy offerings of pines were experienced and an average price of 11d. per dozen was realised compared with 2s. in January. Mangoes, Pawpaw, avocados and granadillas were especially scarce and high prices were realised for good qualities.

Eggs and Poultry.—Smaller quantities of eggs came on the markets and prices in general advanced. On the Johannesburg market 2s. 7d. per dozen was realised for new laid and 2s. 9d. on the Durban market.

On the Johannesburg and Cape Town markets a weaker demand for poultry was experienced and prices declined. A stronger demand was experienced on the Durban market and higher prices were realised for poultry than during the previous month.

Index of Prices of Field Crops and Pastoral Products.

THIS index, as shown elsewhere, remained unchanged at 158 since the previous month (with 1936-37–1938-39=100).

The most important changes occurred in the case of:—

(1) Hay which decreased from 137 in January to 134 in February as a result of the sharp decline in the price of teff hay.

(2) Slaughter cattle which decreased from 183 to 176 mainly as a result of the seasonal decline in prices of slaughter cattle.

(3) "Other field crop products", i.e., potatoes, sweet-potatoes, onions and dry beans, which increased from 179 to 188 as a result of the price increase of potatoes, onions and sweet-potatoes.

(4) "Poultry and poultry products" which increased from 216 to 235 as a result of a further increase in prices of eggs.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938 39	92	107	96	89	79	102	106	92	93
1939-40	86	107	77	95	115	105	106	89	103
1940-41	109	113	106	156	102	108	110	104	108
1941-42	121	134	143	203	102	131	134	145	123
1942-43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158
February	168	183	134	188	122	144	176	235	158

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet-potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Apples, Pears and Grapes on Municipal Markets.

SEASON (1st July to 30th June).	APPLES (Bushel box).						PEARS (Bushel box).		GRAPES (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johannesburg.
	O'heni-muri.	White Winter Pear-main.	Wem-mers-hoek.	O'heni-muri.	White Winter Pear-main.	Wem-mers-hoek.	N.M. No. 1.	Other.	All kinds.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940-41	8 4	7 1	6 4	8 11	10 8	5 0	8 11	6 3	1 8
1942-43	8 11	7 11	7 3	9 1	10 9	6 9	7 3	8 0	1 11
1942-43	14 9	11 6	9 1	10 8	12 11	6 11	—	10 8	1 10
1943—									
January	—	17 5	—	11 5	—	—	—	9 3	2 3
February	10 1	11 0	14 4	8 11	9 0	4 11	—	9 10	1 5
March	8 5	10 1	8 10	9 2	11 8	5 9	—	10 0	2 0
April	13 10	10 6	11 7	10 4	12 2	6 11	—	12 8	2 2
May	16 8	11 11	12 5	12 0	13 0	8 0	—	14 8	2 9
June	18 3	17 1	12 8	14 1	16 5	13 1	—	—	3 4
July	17 3	19 7	—	12 6	17 2	14 0	—	—	—
August	19 5	18 10	13 3	13 10	17 9	—	—	—	8 5
September	19 5	21 10	11 4	12 6	19 1	7 7	—	—	15 0
October	25 3	26 0	—	12 1	15 0	—	—	—	—
November	27 3	29 7	—	11 7	12 8	—	—	—	—
December	29 9	30 0	—	16 7	18 5	—	—	—	6 2
1944—									
January	15 1	—	18 0	16 10	—	—	—	20 7	3 7
February	12 4	—	13 2	11 0	—	6 9	—	14 2	3 5

Average Prices of Slaughter Cattle.

BEEF per 100 lb.

SEASON (1st June to 31st May).	Johannesburg. (a)				Cape Town. (a)			Durban. (b)		
	Prime. No. 1.	Good Medium. No. 2.	Medium. No. 3.	Com-pound. No. 4.	Prime. No. 1.	Good Medium. No. 2.	Medium. No. 3.	N.M. Good. No. 1.	Good Medium. No. 2.	Medium No. 3.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	39 0	36 3	33 9	31 7	36 8	34 3	31 11	—	33 0	—
1939-40	38 5	35 5	33 0	30 10	37 11	35 4	32 0	—	33 7	—
1940-41	41 4	37 11	34 11	32 4	41 1	38 0	34 9	—	34 0	31 3
1941-42	52 1	47 4	42 6	38 4	52 3	48 1	43 1	45 9	—	40 3
1942-43	63 2	57 9	51 5	46 1	60 4	56 3	50 6	55 11	—	45 6
1943—										
January	62 10	57 2	52 1	47 10	63 11	59 3	53 9	55 9	51 0	45 6
February	60 11	55 8	49 11	44 5	62 8	58 3	51 9	55 1	50 4	43 11
March	59 2	54 4	48 1	43 4	57 8	53 8	47 8	52 1	46 8	41 0
April	60 8	55 8	48 4	43 4	59 7	55 0	40 5	52 5	47 2	42 1
May	59 11	55 3	48 11	43 9	61 3	56 11	51 0	52 6	47 6	42 6
June	58 2	54 9	46 10	46 2	58 11	54 8	49 2	52 6	47 6	42 6
July	66 10	63 11	60 3	55 0	66 5	60 2	53 5	57 10	50 5	45 6
August	70 8	65 3	60 6	56 0	75 4	67 9	58 10	63 0	55 0	49 0
September	76 11	72 10	69 0	65 8	76 4	68 7	60 5	63 0	55 0	49 0
October	81 11	77 10	70 8	65 8	78 11	72 0	64 11	63 0	55 0	49 0
November	81 0	75 5	69 5	63 10	87 10	78 11	69 3	63 0	55 0	49 0
December	73 8	69 2	62 10	57 10	89 2	82 2	72 2	63 0	55 0	49 0
1944—										
January	69 11	66 2	60 11	55 8	82 10	77 8	68 0	63 0	55 0	49 0
February	68 6	64 2	56 2	48 5	75 8	70 10	62 6	63 0	55 0	49 0

(a) Estimated dressed weight of cattle as sold on the hoof.
(b) Dressed weight of carcase sold on the hook. According to new meat regulations as from October, 1942, No. 1 corresponds approximately to N.M. good, No. 2 to good medium, and No. 3 to medium.

Average Prices of Sheep and Lambs.

SEASON (1st June to 31st May.)	MUTTON (per lb.).							LAMB (Prime) (per lb.).		
	Johannesburg. (a)			Cape Town. (a)		Durban. (b)		Johannesburg. (a)	Cape Town. (a)	Durban. (b) No. 1.
	Merino Hamels.		Cross-breds.	Merino.	Persians and Cross-breds.	Prime. No. 1.	Medium. No. 2.			
	Prime.	Medium.	Prime.	Prime.	Prime.					
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938-39.........	6·3	5·5	5·8	5·8	5·9	6·1	5·3	6·7	6·4	8·3
1939-40.........	6·5	6·0	5·9	5·9	5·9	6·3	5·5	6·8	6·6	8·0
1940-41.........	6·7	6·1	6·2	6·1	6·3	6·5	5·8	7·0	6·6	8·0
1941-42.........	8·3	7·4	7·5	7·7	7·6	7·7	6·9	8·6	8·1	8·8
1942-43.........	11·5	9·8	9·8	10·7	10·5	10·5	9·6	11·4	10·8	11·3
1943—										
January.......	11·2	9·4	9·5	10·8	10·4	10·7	9·9	11·2	10·8	11·1
February......	10·5	8·6	8·2	10·1	10·1	10·5	9·4	10·4	10·2	11·0
March.........	11·5	9·8	9·0	11·7	11·1	10·2	9·1	11·5	11·3	10·9
April..........	12·0	10·2	9·5	12·4	11·6	10·3	9·5	12·0	11·8	11·0
May...........	12·0	10·3	9·6	11·1	11·1	10·3	9·5	11·8	11·2	11·0
June..........	11·4	10·2	10·4	10·8	11·0	10·3	9·5	11·8	11·3	11·0
July...........	11·4	10·3	10·3	11·4	11·2	10·5	9·8	11·7	11·2	11·1
August........	11·8	10·2	10·8	12·4	12·2	10·8	10·0	11·9	12·6	11·3
September.....	12·8	10·9	12·0	12·0	12·0	10·8	10·0	13·1	12·2	11·3
October........	11·5	9·6	10·1	11·3	11·2	10·8	10·0	12·1	11·5	11·3
November.....	11·9	10·1	10·6	10·9	11·1	10·8	10·0	12·6	11·4	11·3
December......	12·9	11·4	11·5	11·6	12·0	10·7	10·0	12·9	12·1	11·3
1944—										
January.......	12·4	10·4	10·9	12·1	12·0	10·8	10·0	12·5	11·8	11·3
February......	12·3	10·3	9·6	11·6	11·7	10·8	10·0	12·6	11·7	11·3

(a) Estimated dressed weight as sold on the hoof.
(b) Dressed weight on the hook.

Average Prices of Pigs.

SEASON (1st June to 31st May).	Johannesburg. (a)					Durban. (b)			
	Baconers.		Porkers.		Stores.	Baconers.		Porkers.	
	Prime.	2nd grade.	Prime.	2nd grade.		Prime.	2nd grade.	Prime.	2nd grade.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938-39.........	6·2	5·7	5·3	4·9	5·0	6·7	6·2	7·6	6·6
1939-40.........	5·6	5·1	5·2	4·7	4·8	6·7	6·1	7·2	6·3
1940-41.........	5·4	4·5	4·5	3·8	4·0	6·8	6·3	7·1	6·3
1941-42.........	6·6	5·2	5·1	4·0	4·5	8·1	7·1	8·1	6·9
1942-43.........	8·6	7·5	7·2	6·0	6·9	10·3	9·0	10·6	9·1
1943—									
January.......	8·4	7·7	7·8	6·6	8·4	9·4	8·5	10·3	9·1
February......	8·8	7·8	7·4	6·3	8·0	10·2	9·3	10·5	9·4
March.........	8·8	7·7	6·8	5·7	6·2	11·4	10·1	11·3	9·9
April..........	9·1	8·1	6·9	5·9	6·5	11·2	9·7	11·5	9·7
May...........	8·7	7·8	7·6	6·7	6·6	11·9	10·7	12·1	10·4
June..........	8·7	7·8	8·3	7·4	7·4	11·4	9·9	11·4	9·8
July...........	8·6	7·7	8·4	7·1	7·1	10·6	8·8	11·9	9·2
August........	8·7	7·5	8·4	7·2	7·2	10·8	9·1	10·0	8·5
September......	8·9	7·6	7·7	7·0	7·4	10·9	9·9	11·3	10·2
October........	8·8	7·7	7·7	6·9	7·8	10·3	8·6	10·0	8·4
November.....	8·4	6·4	7·7	6·8	7·5	10·2	8·8	10·7	8·8
December......	7·7	6·4	8·1	7·2	7·3	10·3	8·8	11·3	9·8
1944—									
January.......	7·3	6·0	7·6	6·3	6·5	8·7	7·3	10·9	9·1
February......	7·2	6·1	7·7	6·6	6·9	8·5	7·2	10·8	8·9

(a) per lb. live weight.
(b) per lb on the hook.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

SEASON (1st July to 30th June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade I.		Natal.	O.F.S.	Trans-vaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39......	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939-40......	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940-41......	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941 42......	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942-43......	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January....	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February...	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March......	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April.......	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May........	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June.......	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July........	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August.....	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September.	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October....	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November.	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December..	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January....	13 11	11 4	16 11	16 7	22 9	20 3	17 6	17 6	12 11
February..	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON. (1st July to 30th June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Trans-vaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johan-burg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939-40.........	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41.........	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941-42.........	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942-43.........	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January.......	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February......	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March.........	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April..........	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June..........	17 3	17 4	15 3	18 1	12 0	18 9	8 5	8 6	9 2
July..........	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August........	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September.....	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October.......	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
November.....	16 5	—	19 7	—	22 9	25 1	13 5	11 11	10 8
December......	12 11	13 10	9 3	15 1	18 6	16 6	12 0	10 5	9 9
1944—									
January.......	11 3	10 9	8 8	12 3	9 6	11 7	14 1	9 4	11 10
February......	12 7	14 0	7 10	13 3	12 9	13 9	15 8	10 10	11 6

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1st July to 30th June).	Cabages (Bag). (a)			Cauliflower (Bag). (a)			Tomatoes (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940-41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941-42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-43	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2
February	7 5	7 8	22 2	6 8	—	—	4 7	1 9	2 9	2 3

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb. Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb, Cape Town 65 lb., and Durban 85 lb.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.).			Green Peas (Pockets 20 lb.).			Carrots (Bag). (a).		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940 41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942-43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	18 2
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	19 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 11	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11
December	2 1	0 6	2 5	3 8	1 5	5 10	8 6	7 0	7 7
1944—									
January	1 9	1 2	3 5	4 7	1 6	6 7	7 4	3 5	7 10
February	4 4	2 1	4 0	7 2	—	5 9	9 0	6 0	15 1

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb. Cape Town, 90 lb.: and Durban, 120 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1st July to 30th June).	Eggs.			Fowls (Live, each).			Turkeys (Live, each).		
	Johannesburg, New Laid. Per Dozen.	Durban, New Laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40.........	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41.........	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42.........	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942-43.........	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January.......	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February......	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March.........	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April.........	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May...........	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June..........	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July..........	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August........	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September.....	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October.......	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November.....	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December......	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 8
1944—									
January.......	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11
February......	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.).			Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.).		Dry Beans (200 lb.), bags.		
	Johannesburg (a).		Cape Town 1st. grade.		F.o.r. Producers Stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cow Peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40.........	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.........	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.........	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43.........	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January.......	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February......	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March.........	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April.........	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May...........	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June..........	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July..........	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August........	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September.....	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October.......	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November.....	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December......	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January.......	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2
February......	5 2	3 4	7 0	4 5	18 10	19 2	58 1	23 4	30 11

(a) Municipal Market.
(b) Seasonal year for Kaffircorn 1st June–31st May; Dry Beans 1st April–31st March; Lucerne and Teff 1st July–30th June.

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[Photo on Cover by S.A.R. & H.]

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmers' Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ...AFRICA

Vol. 19 MAY 1944 No. 218

Editorial:

Maintenance of our Live Stock.

We are on the threshold of winter—a period of feed scarcity and often of distress for large stock in the Union. For the stock farmer this period has always been fraught with anxiety and misgiving since there is the constant danger of the spring rains failing to arrive after the long, cold and dry winter months.

It has, therefore, become an established practice among the majority of progressive farmers to help their large stock through the winter by providing supplementary feed where the grazing is uncertain in addition to ensuring that adequate stocks are held in reserve for a possible drought in spring.

The excessive rains during the past summer have not only hampered hay-making operations, but have also seriously affected the quality of the veld hay produced, with the result that less reliance than ever can be placed on the natural grazing this year.

Provision for supplementary feed is, therefore, an urgent necessity if we are to tide our large stock safely over the winter in those parts where a sufficient number of reserve grazing camps are not available.

Those farmers who are fully aware of the usefulness and value of their stock have already taken timely measures: They have sown green feed and have taken care to build up adequate supplies of fodder crops for the difficult winter months. The Department has always urged that every stock farmer should make this his aim, since it is in a condition to survey conditions in all parts of the country and, therefore, knows how disastrous neglect in this respect can be for the livestock of the Union. Fortunately the practical example set by progressive farmers throughout the Union is helping to demonstrate to others that the timely provision of feed is essential for the maintenance of a sound and prosperous livestock industry. The large number of silos and haystacks to be seen on many farms in the Union are striking examples of this progressiveness. That these farmers are well rewarded for the timely provision of feed is evidenced by the thrifty condition and growth of their cattle, the good prices obtained for their fat slaughter oxen, the excellent production of their dairy cows and the adequate number of well developed young cattle to replenish their herds—the logical results of providing feed which will enable the animals largely to maintain their summer condition and summer production even through the winter months.

Owing to the present high price levels of grain and hay products, farmers are unfortunately prompted to dispose of such products for cash, and the results of this tendency are already manifesting themselves in the leaner condition and poorer development of young stock.

The Department, therefore, urgently requests farmers to think twice before allowing their stock to suffer from lack of feed during

[*Continued on page 294.*

Building Site for the Silo.

L. C. J. Gertenbach, Extension Officer, Dundee.

THE farmer who comtemplates building one or more silos must decide beforehand on a suitable site for the structures, and on their size.

The points to be taken into consideration are the following:—

(1) The use to which the silage will be put, (2) the distance from the lands to the silo; and (3) the distance from the silo to the place where the animals are fed.

After these three points have been considered, the following must be taken into account, namely, convenience and economy in filling the silo, convenience and economy of labour in emptying the silo, and convenience and economy in the building of the silo.

Uses of Silage.

The uses to which silage is put can be subdivided as follows:—(*a*) exclusively for dairy cows; (*b*) for the fattening of oxen; and (*c*) as supplementary feed for dry stock.

In the first case the ideal site for the silo would be near the byre or milking shed. (When the latter is built, its site should also receive careful consideration.) The silo should be built in such a way that the silage can be transferred straight from the silo into the shed. In the case of a tower silo the opening should lead into the small passage behind the manger in order that the feed can be loaded on to a cart or dumped into a wooden container for conveyance to the manger. This also applies to the trench or pit silo, in which case an opening is made in the wall of the byre. If, as is generally the case, the byre is provided with two rows of mangers, the best plan will be to erect two or more silos.

Where oxen and dry stock are to be fed, it is best to take the farming system into consideration. As a rule, store oxen are not allowed much grazing, so that in their case it would be best to build the silo near the lands. A lean-to and a manger can then be built around the silo, and a small room erected for the storage of meal and grain for the oxen. This procedure would reduce the transport costs to a minimum, and will prove the most economical from every point of view.

Where silage is used solely as supplementary feed for dry stock, winter grazing and the lands must be given consideration. If winter pastures permit of the production of silage crops, the silo should be erected near them and provided with a manger as described above. If this is not possible, the lands nearest to such pastures should be used for the cultivation of silage crops and the silo erected in the camp.

From the foregoing it will be clear that, whatever course is adopted, the main consideration should be to make the *conveyance of the silage* from the lands to the silo and from the silo to the manger as convenient as possible. The same consideration applies in the transport of compost, which should in any case be made on the feeding sites.

Filling of Silos.

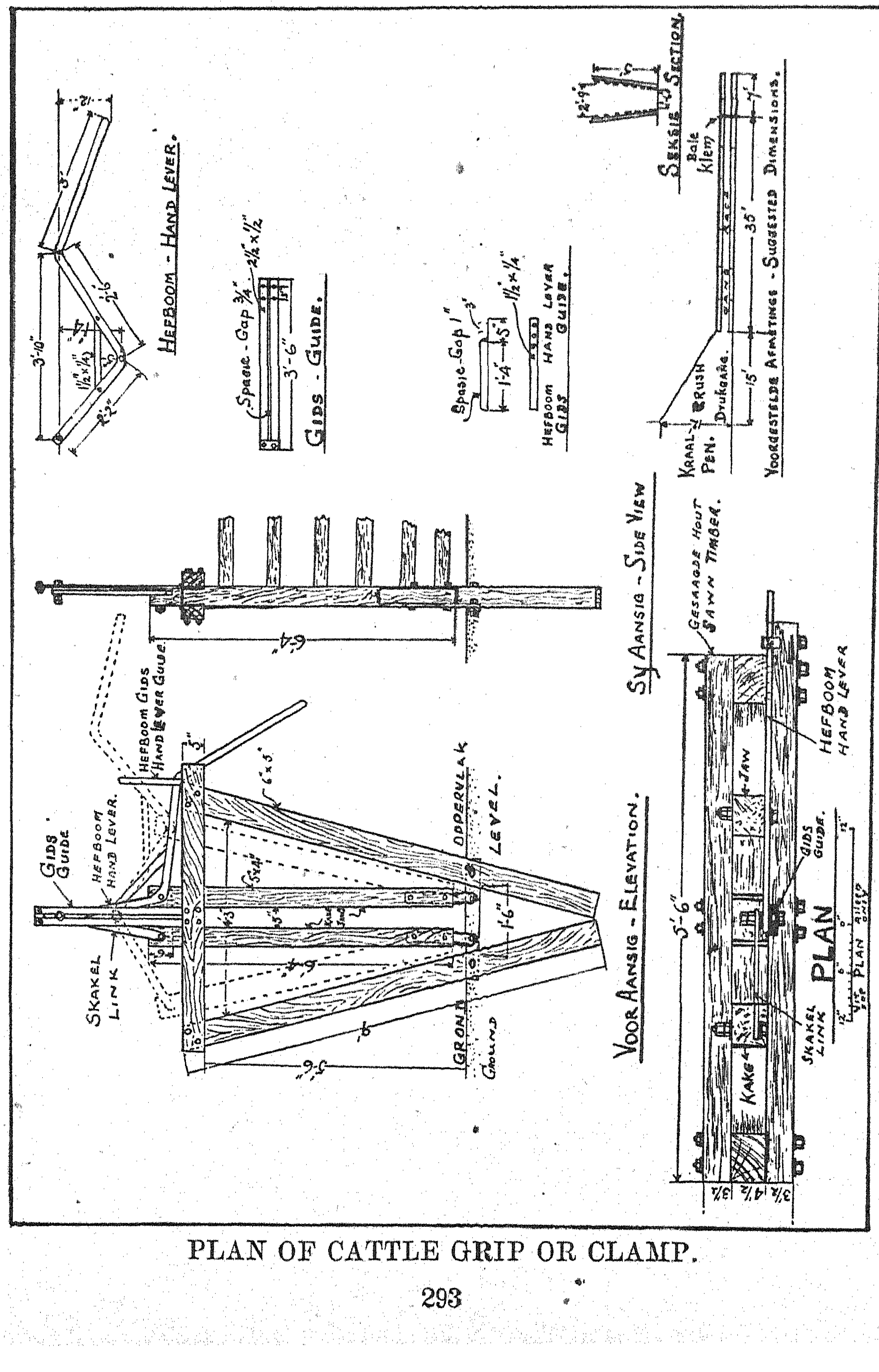
After the site for the silo has been finally decided on, the other points mentioned above can be given consideration. If it is possible, for example, to build a tower silo where a lorry or wagon can be driven to a point on a level with the top of the silo, the latter can be filled from above. This is only rarely possible, however. If a cutter

 [*Continued on page* 310.

A Cattle Grip or Clamp.

J. P. J. van Vuren, Extension Officer, Ficksburg.

ALTHOUGH a crush greatly facilitates the handling of cattle, general experience has shown that it does not enable animals to be brought under complete control. Hitherto the practice has been to insert loose transverse poles through openings in the crush, in front of and behind an animal, in order to make it stand while being handled. Only too often, however, the animals either turn round,



PLAN OF CATTLE GRIP OR CLAMP.

attempt to force their way between the poles, or jump over them. In fact, they do anything but stand still. In order to make the handling of cattle in a crush absolutely effective, a grip or clamp such as that shown in the accompanying illustration, is indispensable.

On a recent tour through Southern Rhodesia the writer noticed that almost every farmer with whom he came in contact, had provided his crush with such a cattle clamp. In the East Coast fever area south of Salisbury, he had the privilege one morning of seeing how effectively this clamp worked. The farmer concerned was engaged in hand-dressing his cattle, about 2,000 in number, against ticks. Five labourers proved to be quite sufficient for this work. Two natives drove the cattle into the crush, two stood next to the crush, one on each side of it, to treat the cattle once they were gripped in the clamp, and one manipulated the grip itself. A minimum of time and effort was required to carry out this troublesome operation.

The writer was so greatly impressed with the effectiveness of the clamp that he made further enquiries and was provided with a blueprint of its design. A sketch of the clamp originally appeared in the "Rhodesia Agricultural Journal", and in August 1939 a reprint (No. 1124) was published. The illustration shown is a copy made from the original as it appeared in the reprint mentioned.

How the Clamp Works.

The front elevation of the clamp is as seen from inside the crush. By raising the lever, the jaws of the clamp are opened, as indicated by the dotted lines. As soon as the neck of an animal walking normally through the crush is opposite the clamp, the lever is depressed and the animal's neck is securely gripped. Immediately the treatment has been completed, the lever is raised and the jaws open wide enough to allow the animal to walk on undisturbed.

In this way one person can handle the clamp, as well as the animal gripped. Cattle soon become used to it, and a considerable saving of time and labour is obviously effected. Where fairly wild cattle must be handled, the lever handle can be lengthened by means of a piece of piping, so that the operator can stand a little further back from the crush to avoid frightening the animal by his close presence. Where very young cattle are handled, the space between the jaws of the clamp can be regulated accordingly.

As will be seen from the illustration, the quantity of material required for the construction of the cattle clamp in an existing crush, is so small, and the cost and trouble involved, so trifling, that no farmer who has a crush on his farm, should remain without one. This clamp is so effective that it is absolutely indispensable in handling cattle for the purpose of dosing, injection, inoculation, branding, dehorning, treatment against ticks and for wounds, etc.

Maintenance of our Live Stock:— [Continued from page 291.

the winter months. They should bear in mind that the building up of a sound livestock population is a matter of many years, and that lack of adequate feed may result in a set-back, the effects of which will take years to repair. Farmers are, therefore, warned not to allow the sound and recognised practice of providing feed on which the welfare of our livestock depends, to be upset by the present, temporary disturbing influences.

(W. F. Bergh, Senior Animal Husbandry Officer, Division of Animal and Crop Production.)

Cultivation and the Soil Mulch.

Dr. A. R. Saunders, Senior Research Officer, College of Agriculture, Potchefstroom.

OF all the beliefs and theories concerning the cultivation of the soil, few have found such ready acceptance as that of the soil mulch as a means of conserving soil moisture. In South Africa the lack of moisture is a problem which seldom ceases to trouble the mind of the farmer, who, although rightly conservative in his outlook, is ready to grasp at any simple method which is likely to improve the chances of obtaining a good crop in spite of the limited and erratic rainfall. The soil-mulch theory appealed to him because of its plausibility and the ease with which the method could be applied, with the result that the belief in it has now become firmly established.

For a considerable time the theory also held sway amongst scientific agriculturists. Masses of technical evidence were adduced in its support, but this evidence was in most instances based on laboratory studies of soil in an artificial state. Even so, discrepancies were found and, no matter how facile the arguments to explain them away, the whole issue has time and again been thrown into doubt. In consequence it has once more become an important subject for discussion and investigation.

Experiments.

To review all the experimental work carried out overseas is far beyond the purpose and scope of this brief article. Critical investigations under South African conditions are few and far between, and, as might be expected, the meagre data available are to a certain extent conflicting. Thus McKenzie[5] at the Glen College of Agriculture in 1928 reported an apparently marked beneficial effect of cultivation to maintain a soil mulch as compared to scraping off the weeds and leaving the surface soil undisturbed. That this effect might have been real is by no means an impossibility, but the soil was of a type which readily forms a crust after a rain and the question arises whether the result obtained was due to moisture conservation or to better moisture absorption on the cultivated than on the uncultivated plots.

Simultaneously with the experiment at Glen there was another in progress at Pietersburg in the Northern Transvaal. The results have been previously reported by the writer[6]. They agree in the main with those of McKenzie, and their most striking feature is the failure, during 1924-25, of the maize crop to produce any grain at all on the plots where weeds were left undisturbed, while the best method of cultivation that year gave a yield of over 25 bags per morgen. In 1939-40 and 1940-41 Hofmeyr[3] at Glen again obtained results in close accord with those already quoted, except that cultivation to preserve a soil mulch had no advantage over that required to control weeds.

On the other hand, an experiment conducted at Potchefstroom during 1934-37 yielded no significant differences at all between four different treatments under conditions where all weeds were rigorously controlled. The results are given on the following page:—

Neither during any one season nor over the whole period of the experiment was there any difference of importance, and it appears that on the soil of this experiment cultivation has no advantage whatever, provided weeds are eradicated. The soil is a reddish

TREATMENT.	YIELD OF MAIZE IN BAGS PER MORGEN.			
	1934–35.	1935–36.	1936–37.	Mean.
1. No cultivation, weeds scraped off..........	17·48	21·81	23·78	21·02
2. Flat cultivation as often as necessary to preserve soil mulch......................	16·16	22·12	24·61	20·97
3. Flat cultivation three times only...........	16·56	22·34	24·72	21·21
4. Ridge cultivation three times only.........	16·58	22·17	24·76	21·17
MEAN......................	16·67	22·11	24·48	21·09
Significant difference........................	2·22	1·51	1·74	1·01

brown loam which is readily permeable to moisture, not inclined to crust, and has a very slight slope.

The experiments so far reported were conducted under dryland conditions. In 1934 and 1935 Esselen(2) carried out extensive soil-moisture investigations under irrigation on a light sandy soil at the sub-tropical Horticultural Research Station, Nelspruit. Among the conclusions to which he came the following are particularly pertinent—

(1) the rate at which moisture is lost from a bare soil is for all practical purposes the same, whether the soil is mulched or not;

(2) the rate of loss decreases with depth, more than half the total lost by the upper 3 feet of soil coming from the top 6-inch layer in 1934 and from the top 12-inch layer in 1935;

(3) evaporation is rapid during the first 10 to 14 days after irrigation.

For the soil mulch to be effective, therefore, it would have to be formed while the soil is still too wet to be cultivated without seriously impairing its structure.

Similarly, Eksteen and Van der Spuy(1) at Glen, working on a heavy clay soil, found no noticeable effect of a soil mulch on the evaporation of moisture from the soil surface. But the results of their experiments bear striking testimony to the disastrous effect of uncontrolled weed growth on maize yields, as shown by the following figures:—

Mean Yield of Air-dry Material (in lb. per morgen).

WEED-INFESTED PLOTS.			CLEAN PLOTS.	
Weeds.	Maize.		Maize.	
	Stalks.	Grain.	Stalks.	Grain.
8,852	3,015	160	5,777	1,718

The figures speak for themselves and illustrate one of the main causes of low maize yields in this country, viz., the competition which the crop has to endure with weeds. In this experiment it was also possible to measure the amount of water lost by run-off, which was appreciably less on cultivated than on uncultivated soil. Further-

more, soil cultivated to a rough, broken surface, was not readily subject to erosion by wind.

Capillary Water.

The practice of soil mulching has its foundations largely in the theory of capillary movement of moisture in the soil, a theory which has had a great appeal because of its attractive simplicity. It was merely a case of elementary physics: the rise of liquids in open tubes of narrow bore. The pore spaces between particles of soil were regarded as forming more or less continuous tubes through which water would move by the action of surface tension. The finer the soil the narrower the tubes and hence the greater the height to which water would rise. Clayey soils would, therefore, be less prone to drought than coarse-grained sandy soils. Furthermore, cultivation would disrupt the capillary tubes in the upper few inches of soil and produce a loose " blanket " or mulch of dry soil with pore spaces so large that the water could not rise through them to be lost by evaporation. On the other hand, rolling would compress the top soil, thus narrowing the capillary tubes and enabling them to draw water from lower depths.

The New Theory.

But the failure of water to rise through soil to the heights prepredicted soon showed that all was not well with the capillary theory and several workers re-opened the subject on different lines. Particularly important experiments have been conducted at the Rothamsted Experimental Station by Haines and Schofield. The results of these experiments have recently been discussed by Dr. Keen[4] in an article which challenges many traditional ideas. As regards soil-moisture movement the new theory, which has been confirmed experimentally, postulates that the pore spaces in the soil are " essentially of a cellular nature, consisting of relatively large voids communicating with one another through relatively narrow necks. The moisture distributes itself in curved films within these cells and necks in accordance with the physical principle that it tends to reduce its free surface, and hence its surface energy to a minimum. The pressure under a curved water meniscus is less than outside, and the greater the curvature the greater is the pressure deficiency. The pressure deficiency, therefore, is a suction force which controls the filling or emptying of the cells."

To quote further: " The manner in which filling or emptying occurs can be seen by taking a simple case. Let a cell and its necks be full of water and suppose evaporation is taking place at one of the necks. The water level in this neck will retreat steadily, until the meniscus reaches the narrowest cross-section of the neck. Here the equilibrium becomes unstable, because further retreat of the meniscus carries it into a wider cross-section where a smaller pressure deficiency than the one already built up would be adequate to maintain equilibrium. Hence expansion into the cells takes place abruptly, or, in other words, air suddenly enters the cell and a portion of the water is displaced to new positions."

" Similarly, when the moisture content is increasing from dryness to saturation, once the thickness and curvature of the water film lining the cell and necks attain a certain value, instability sets in. The films in one or more of the necks suddenly close, the stability of the air bubble in the cell becomes full of water. One salient feature of the moisture relations is, therefore, the quantum-like movements of water associated with filling and evacuation of the cells. But there is another important consequence of the theory:

the opening and collapse of a neck (and the emptying and filling of a cell) do not occur at the same pressure deficiency. . . . The drying curve lies wholly above the wetting curve. Hence the moisture content in equilibrium with a given pressure deficiency is higher if the soil is drying out than if it is being wetted."

In other words, the water in the soil tends to resist changes, whether these are in the direction of increasing or decreasing moisture content. "The bearing of this on the question of water supply to plant roots is obvious. The capillary theory taught that the drying due to water-inhibition by the roots was met by movement of water from moister regions, i.e., the water was brought to the plant roots. The correct view, however, is just the opposite: the plant roots have to ramify extensively through the soil in search of moisture. We can now see in their true light the real effects of hoeing and rolling. The action of rolling is primarily the purely mechanical one of compressing loose but moist soil more closely around the roots of the young plant, so that they can more easily obtain the moisture. For any water movement of the type postulated in the capillary theory to take place the soil would have to be so moist that no farmer would think of ordering the operation: the results on soil tilth would almost certainly be disastrous."

"As for hoeing, there can be no general upward movement of water except in those cases of low-lying land where a water-table is very near the surface, and even then the rate of upward movement is exceedingly slow. In this case, as in the much commoner one where the water table is well below the surface, the tendency of the water to resist changing conditions means, in effect, that it evaporates *in situ;* the dried-out surface layer progressively deepens. Most soils are, in fact, 'self-mulching', and the use of a hoe to produce a soil mulch is, from the viewpoint of direct water conservation, a work of supererogation, except for those soils that tend to produce a hard crust or cap when drying. In these cases hoeing will break the crust in its incipient stages and so save the tender roots from damage. Of course, by destroying seedling weeds, hoeing prevents their competition for the available moisture and thus, indirectly the operation conserves water."

Cultivation.

In the last sentence of the above quotation lies the essence of the the matter as regards the value of cultivation or hoeing. Its primary function is the destruction of weeds; all other effects it may have are secondary. Until recently it could be argued that the cost of cultivation was in any case not a serious matter since animal draught was used and the animals, as well as the farm labour, had to be kept whether they did any work or not. With the greater mechanisation of our agriculture, however, the situation has changed very markedly. Every time a tractor is used the farmer has to reckon with the cost of fuel and oil and of wear; accordingly there is a strong economic argument of reducing operations to a minimum.

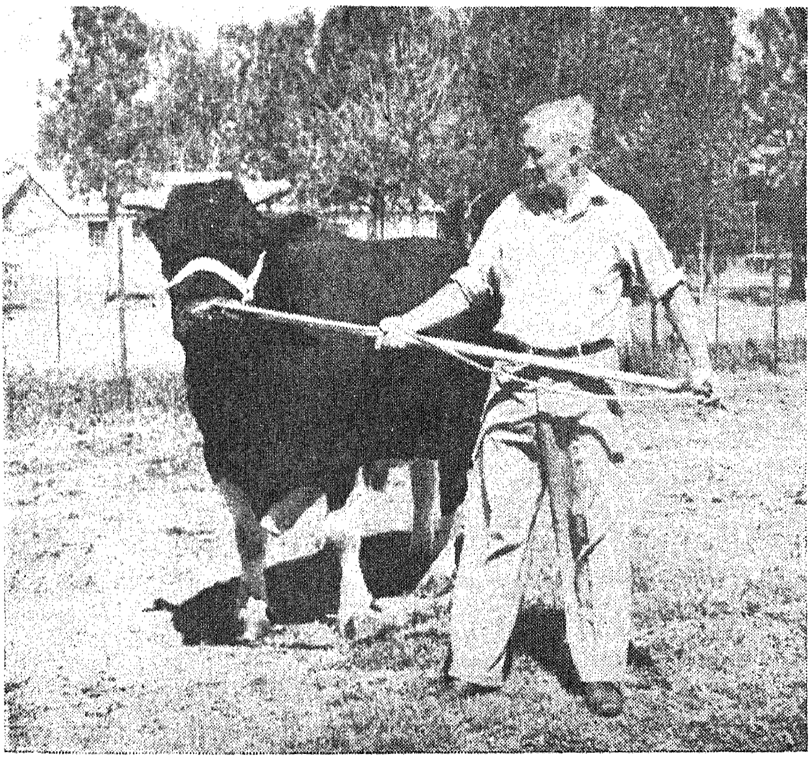
On the point of the best time of cultivation there is little experimental evidence available in this country, but according to known facts and on the basis of practical experience there can be no doubt that it is during the early stages of growth of crops that all efforts should be bent towards the eradication of weeds. The weeds themselves are most sensitive to injury when small, and one or two thorough cultivations during the first month after planting are probably worth many more afterwards. According to the writer's experience the least extensive and most effective programme of weed control in maize production is the destruction of at least one or two

[*Continued on page* 344.

The Management of Bulls.

Dr. L. L. Roux, Senior Professional Officer, and E. Adler, Lecturer in Animal Husbandry, College of Agriculture, Glen, O.F.S.

THE rate of improvement in any herd depends largely upon the quality of the sires used. A sire of outstanding quality usually commands a high price, *but remunerative returns will only be obtained when such bulls are vigorous and fertile and their usefulness is extended over a number of years.*



The Rigid Bull Pole in use.

The task of rearing vigorous fertile bulls begins with the care of the calf. Satisfactory conditions for growth should be provided when the growth impulse is greatest. While it is true that some growth impulse does exist in spite of adverse conditions, poor treatment has detrimental effects upon body development, and, when prolonged, it results in unsymmetrical, scraggy, sluggish, and frequently impotent males. Improper management is most evident under conditions where cattle farming is undeveloped, where hardy bulls are desired and where very often bulls of the improved breeds have been introduced for use on poor quality and nondescript females.

It is not intended to advocate the pampering of bulls and especially those which will, eventually, be used on ranching conditions. Certain breeds and types, which are suitable for a set of favourable conditions, may not prove satisfactory under even moderately "hard" conditions. The choice of suitable or adaptable types for any particular environment is strongly advocated. It is realized

that, in many parts of the country, hardiness and resistance to disease are the most important qualities desired in ranching bulls.

The following discussion is intended as a general guide which may be helpful in planning practical methods of control in intensively managed dairy herds and under extensive ranching conditions.

The Calf.

The existence of various systems of farming do not permit the making of hard and fast rules for the rearing of calves from birth to weaning age. Methods which are satisfactory in the case of commercial dairy calves may not be applicable in the case of stud calves, and the methods applied to ranch beef bulls are vastely different to those employed in the case of the former.

Modifications of the following two systems will be found to suit most circumstances, viz., (*a*) handrearing, the method generally applied in dairy herds; and (*b*) suckling the dam, the method adopted in beef herds.

(*a*) *Handrearing.*—Various methods of handrearing calves have from time to time been compared at the Agricultural Colleges and Experiment Stations, and readers who are interested should apply to the College of Agriculture of their area for information available upon calf rearing.

Milk is essential for the normal growth and development of calves. Whole milk has a higher feeding value than skim milk, and the former is especially valuable to calves during the first 2 or 3 months of the calf's life. Breeders of pedigree stock make use of various combinations of whole-milk and skim-milk rations.

At the College of Agriculture, Glen, O.F.S., the following feed schedule has been used with success for a number of years.

Age of Calf.	Feed per Day.			Remarks.
	Whole Milk.	Grain.	Lucerne Hay.	
	lb.	lb.	lb.	
Birth to 1 day..........	With dam	—	—	Dam's milk for 5 days.
2–14 days............	7–8	—	—	Fed 3 times per day.
2–3 weeks...........	8–9	$^1/_{16}$th	—	Fed 3 times per day.
3–4 weeks...........	9–10	$\frac{1}{8}$th	Very limited quantities	Fed 2 times daily.
4–6 weeks...........	10–11	$\frac{1}{8}$–$\frac{1}{2}$	Limited	—
6–8 weeks...........	11–12	$\frac{1}{2}$–1	Free access	On veld grazing. Poor quality.
8–12 weeks..........	12–13	1–2$\frac{1}{2}$	Free access	"
12–24 weeks..........	13–14	2$\frac{1}{2}$–5	Free access	

When all feedstuffs were readily available, a ration from the following grain mixture was fed:

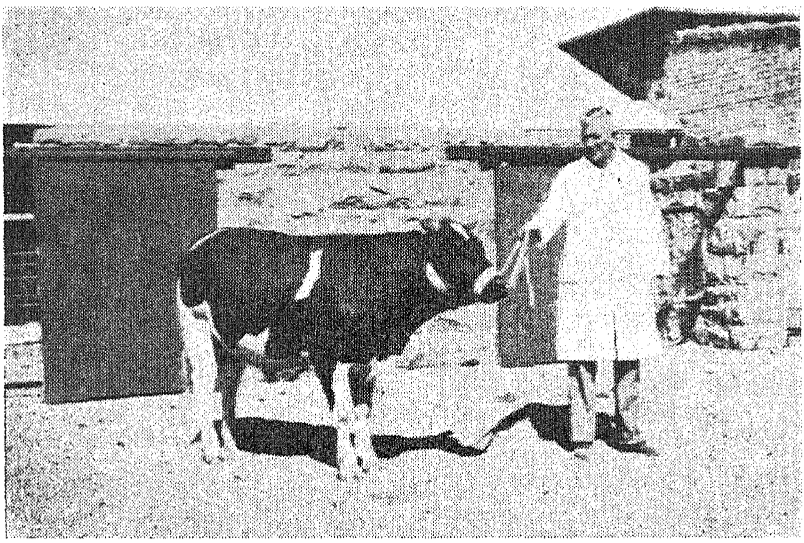
800 lb. Yellow Maizemeal.
200 lb. Crushed Oats.
100 lb. Wheaten Bran.
100 lb. Monkeynut Oilcake.
100 lb. Linseed Oilcake.
3 per cent. Bonemeal and 1 per cent. Salt.

Due to the scarcity of certain feedstuffs during the war period, some of the feeds included in the above mixture had to be replaced

by others. The grain mixture being used at present consists of the following:—

350 lb. Yellow Mealiemeal.
100 lb. Crushed Oats.
100 lb. Hominy Chop.
100 lb. Beanmeal.
100 lb. Cocoanut Oilcake meal.
50 lb. Linseed meal.
18 lb. Bonemeal.
6 lb. Salt.

Calves fed according to the above schedule consume from 200 to 225 gals. of milk and from 350 to 380 lb. of grain mixture from birth to 24 weeks of age.



Correct way of holding a bull.

At this College, non-registered Frieslands are reared on skimmed milk from the age of 3 weeks. The amounts of skimmed milk fed, is increased from the fourth week up to the fifth month to a maximum of 1½ gal. per calf per day.

The following two rations gave satisfactory results in an experiment conducted at the Research Station, Ermelo (1). The ration is one which involves the feeding of only a *limited* quantity of whole milk. This would be of interest to the cheese (whole milk) supplier who desires to raise a few bulls. The skim-milk ration is of a standard type which is accepted generally as being most efficient.

(1) *Whole-milk ration:*

1st to 3rd day, nursed by dams.
4th day to 3rd week, whole milk.
4th week to 11th week, whole milk plus grain mixture.
12th week to 26th week, no milk, but grain mixture consisting of—

finely crushed yellow maize ... ... 32 lb.
wheaten bran ... ... 6 lb.
peanut meal ... ... 4 lb.
blood meal ... ... 2 lb. and
5 per cent. of 2 parts bonemeal and 1 part of salt.

Good quality lucerne hay was fed from the 3rd week. The average birth weight of the calves was 82·4 lb., the average weight at 24 weeks of age 325·6 lb. and the daily gain 1·34 lb. throughout the period.

(2) *Skim-milk ration*:

1st to 3rd day, nursed by dams.
4th day to 3rd week, whole milk.
4th week to 7th week, whole and skim milk.
8th week to 26th week, skim milk plus grain mixture as follows:—

(*a*) 8th to 22nd week: finely crushed yellow maize.

(*b*) 23rd to 26th week: 85 lb. finely crushed yellow maize, 15 lb. peanut meal, and 5 per cent. of 2 parts of bonemeal and 1 part of salt.

Good quality lucerne hay was fed from the 3rd week. The average birth weight of the calves was 81·2 lb., the average weight at 26 weeks of age 382·2 lb., and the daily gain 1·67 lb. throughout the period.

In these schedules the quantities consumed may be influenced by the size, breed and other factors. The costs will vary in accordance with the costs of each item of feed.

Mixed grains should be fed in preference to a single grain, especially maize . Maize, oats, and wheaten bran may be fed in the proportions by weight 3, 2, and 1 respectively. The inclusion of oil cakes not only promotes rapid growth, but gives extra quality to the skin and hair. The following ration is recommended:—

Maize	8 parts (by weight).
Oats (whole or crushed)	4 parts (by weight).
Wheaten bran	2 parts (by weight).
Soybean or monkeynut oil cake ...	1 part (by weight).
Linseed-oil cake....	1 part (by weight).

The inclusion of oil cakes is also recommended when legume hays are not available, as the former increase the protein content of the ration.

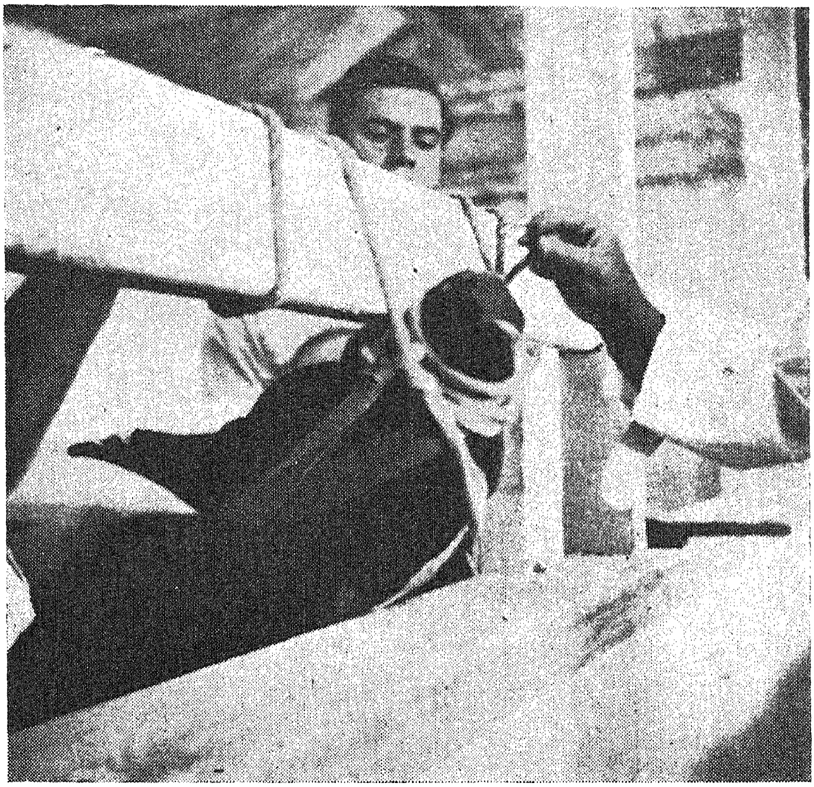
Feeding of Calves.

Young bulls should be induced to eat concentrates and hay at 2 to 3 weeks of age. Lucerne, soybean, and cowpea hays are suitable. The concentrate ration should be increased according to appetite; it should be in the vicinity of 5 lb. when the bull calf is 6 months old. At first the quantity of hay should be limited, but after 3 months of age, calves should have free access to good quality hay.

Valuable calves warrant very special attention. Owing to the danger of diseases such as paratyphoid, blood scours, etc., the young calf should be placed in a single pen immediately after birth and the pen should be well drained and kept scrupulously clean by regular washing and the use of disinfectants such as chloride of lime. Liberal quantities of clean bedding should be supplied. Dung should be removed daily and the bedding turned and aired.

The calves should not be put out to pasture until they have fairly high powers of disease-resistance or when they are about 6 weeks old. Although green grass is a valuable feed, a little of it is preferable to too much; grass and succulents such as silage, roots, etc., should not take the place of milk and the more growth-promoting grain feeds and hays, such as oats, bran, oil meals, and legume hays.

The young bulls should be separated from the heifer calves at 5 to 6 months of age. At this stage, the former require slightly more concentrates than the latter. Care should be taken that they are not underfed. If pastures are very good, very little grain feeding may be necessary, but in most parts of the country few dairy breeds will maintain satisfactory growth on pasture alone. Good legume hay is an excellent supplement, but good concentrates are the best promoters of growth.



Inserting the ring.

Young bulls can be fed the same concentrate mixtures as advised for handrearing of calves. If they cannot be put out to pasture, they will benefit greatly by being fed reasonable quantities of green feed in addition to hay and concentrates.

While vigorous growth should be encouraged, young bulls should never be allowed to become too fat. This can be accomplished by proper feeding and exercise.

(*b*) *Suckling the dam.*—The principal part of the calf's ration is provided by ensuring that the dam receives treatment which will provide an adequate supply of milk for maintaining health and promoting normal growth. This aspect of management is particularly important when calves are born during dry or unfavourable seasons. If calving takes place during autumn or winter, special camps should be saved for the cows with calves at foot, or special provision of feed should be made. Under ranching conditions, it is usually not the

practice to separate the calves from their dams at any time before weaning. Under such conditions calves can be given supplementary feed by using camp creeps, which permit the entrance of calves to the feed troughs, but exclude the dams.

Under certain conditions, the feeding of the dam with spineless cactus, ensilage, legume hay, or preferably a combination of legume hay and one of the succulents will ensure that both the dam and calf are kept in good condition and health. The type and quality of the grazing will determine the need for feed and the kind of supplementary feed to be given. For example, in the sourveld or high-rainfall areas, the veld is almost valueless in the winter, necessitating feeding a balanced ration consisting of concentrates, hay, and green feed, whereas in the dry sweetveld areas, no extra feeding of the cow, except bonemeal, may be required during favourable seasons.

Beef calves are generally weaned at approximately 8 months of age when the bull calves should be separated from the heifers. In very favourable circumstances it may be necessary to wean and to separate the sexes at an earlier age.

It is imperative that the bull calf should continue to receive suitable treatment to ensure normal development which will render him fit for light service at an early age. Young bulls should be mated to a small number of females as soon as possible in order to test their breeding abilities. In order to accomplish maximum development and early sexual maturity, young bulls should receive supplementary feeding when good grazing is not available or when spells of drought occur. All bulls require handling, and although some become fierce through no reason what-so-ever, many bulls are spoilt by incorrect or careless handling.

In order to avoid repetion. the methods of handling dairy and beef bulls will be discussed together later on.

Environment and Nutrition.

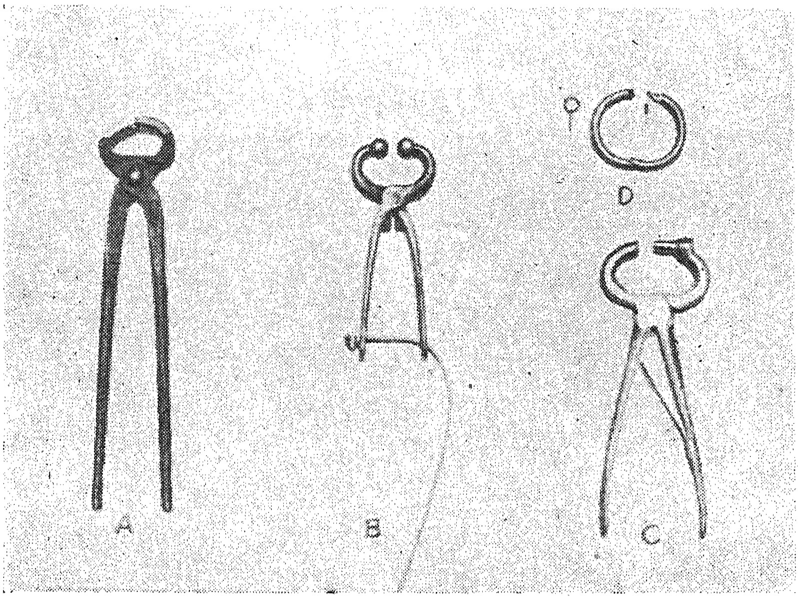
The influences of climate and nutrition are of particular importance because high summer temperatures are experienced in many cattle-breeding areas, while, under certain systems of farming, the tendency is to underfeed young growing bulls and bulls in service. On the other hand, large tracts of the country enjoy a moderate climate and have good pastures; these areas have proved to be very suitable for the production of high-class stud stock.

Improved European breeds of cattle are not physiologically adapted to the high temperatures and intense solar radiations characteristic of tropical climates. On the other hand, certain breeds, indigenous to tropical climates, are able to grow, produce, and reproduce normally under such conditions. The quality is inherent as the crosses of these tropical breeds exhibit the same adaptabilities.

Under tropical and subtropical climatic conditions, improved exotic breeds experience a rapid increase in body temperature (101·5-106·0° F.) and respiration count (30 to 100 and over per minute) when atmospheric temperatures rise above 80° F. The former are somewhat lower in the shade than in the sun. Native or indigenous breeds react only very slightly to such increases; they are phsyiologically better adapted to a tropical climate. Breeds which are unadapted to tropical conditions are unable to expell surplus body heat which results in a decrease in the utilization of food, cessation

of rumination, and the animal's body remains in a state of fever for long periods. The facts reveal the need for particular attention for the protection of bulls against excessive heat. This can be accomplished by the provision of shade at all times. Their yards and boxes should be constructed to give a maximum amount of shade and ventilation. Under severe conditions they can be relieved considerably by wetting them thoroughly with cool water once or twice a day.

The transferring of bulls to hot climates, should be done during the winter months and preferably some months before they are to be used.



Instruments.—A: Hoof Clippers. B: Bull Holder. C: Nose Punch. D: Bull Ring.

In the selection of bulls for conditions generally described as "hard" or "adverse", hardiness should receive due consideration. The contention has been expressed that selection of types for much of the cattle country of South Africa should be based on greater ruggedness, rather less fineness of skin and bone and rather later maturing qualities than are demanded for the standard representatives of the imported beef breeds. Animals with thick skins are less susceptible to overheating than those with thin skins. The opinion has also been expressed that permanent breeding herds should always be bred *up to* and never *down to* environmental limits.

The general environment and the feed requirements of bulls are closely related. Rations differ from season to season; the best possible use should be made of farm-grown feeds. A good ration is that which keeps the bull in hard vigorous condition; the animal should show keanness to take exercise and eagerness to serve; he should not be allowed to become fat and paunchy.

The bull in service requires more proteins than an idle bull. Ten pounds of good legume hay or one pound of soybean or peanut oil cake should supply sufficient protein to a bull on average veld.

If the pasture is poor, additional concentrates should be fed; mixtures containing two or three concentrates, such as oats, maize, bran, and oil meal, are preferred.

A stable-fed bull not on pasture should receive a balanced ration of mixed concentrates and legume or mixed hays. The requirements of the mature bull are from 4 to 6 lb. of concentrates and 13 to 20 lb. of hay. A mineral mixture of 3 oz. bonemeal and 1 oz. salt should be given. Green soiling crops are excellent and silage is good, but it should be fed sparingly, say about 10 to 12 lb. a day, to prevent paunchiness. Green feed helps to maintain the appetite and it supplies the vitamins so necessary for health and vigour.

Exercise is also essential for maintaining good health, vigour and fertility. If bulls cannot be given free range in suitable paddocks, they should be led daily; a mature bull should walk at least one mile daily.

Malnutrition results in retrogressive changes in the sex organs even after they are developed, and permanent sterile conditions such as atrophy may result. A ration of maize and non-leguminous hay (such as teff) fed for two months proved to be unsatisfactory for the maintenance of fertility in an experiment where four services were allowed per week. Two weeks on a concentrate ration containing oats, wheatbran and lime, in the form of oystershell flour, restored fertility.

The feeding of bulls is an important factor in assuring their fertility and prolonging their life of usefulness.

Re-productive Capacity.

The general tendency is to accept the herd sire as being fertile. Suspicions arise only when cows repeatedly return for service every 18 to 24 days. Eagerness and ability to serve are not conclusive proofs that the bull is fertile.

Bulls may differ considerably in their fertilizing capacities. Low fertility or absolute sterility may be caused by physiological abnormalities or pathological conditions of the genital tract or associated organs. General ill-health and even spells of adverse weather conditions may cause temporary infertility, the period of continuation of which depend upon the severity and the duration of the cause.

In a normal healthy herd 1·7 services per conception can be considered good. Bulls that give an average of 3 or more services per conception may be considered to be of low fertility.

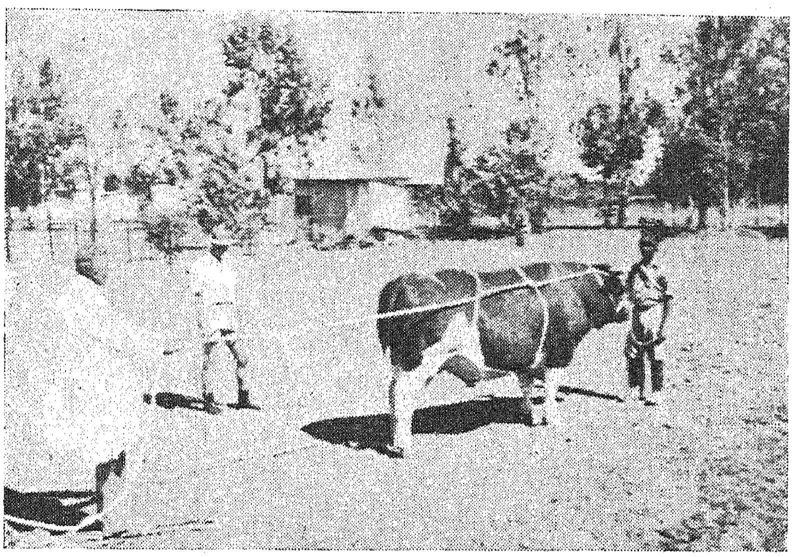
Young bulls become sexually mature at 7 to 9 months of age, but they should not be used before they are about 12 to 13 months old and then only sparingly. They should not be allowed more than one service per week for the first few months and then 2 services per week until they are 18 months old; most bulls are not fit for full service until they are 2 to 2½ years old.

According to the knowledge of the authors no data are available to establish relationship between frequency of copulation and fertility. However, it is thought that 1 to 3 services daily by a vigorous healthy bull are likely to give good results. Frequent copulation result in small ejaculates and a reduction of fertilizing ability. This is especially the case in young bulls. A day of rest has a marked beneficial influence upon semen quality.

There is a direct correlation between air and body temperatures of cattle exposed to tropical and sub-tropical conditions. There is

also a direct correlation between air and skin temperatures, air and scrotum temperatures and also between body and skin temperatures and body and scrotum temperatures. Hence, when air temperatures rise above a certain point, body, skin, and scrotum temperatures increase. For 1° F. increase of air temperature an increase of scrotal temperature of 0·23° F. to 0·36° F. has been recorded. For 1° F. increase of body temperature the scrotal area temperatures increased from 2·11° F. to 2·85° F. The scrotum functions as a thermostat maintaining the testes at a fairly constant temperature considerably below that of the body cavity. Insulation of the scrotum destroys its heat regularity function and results in the formation of abnormal spermatozoa.

In addition to excessive heat, many other causes result in the formation of abnormal spermatozoa. Some of these are: general low condition, malnutrition, disease, internal and external parasites, etc.



Reuffs Method of casting a bull.

Mating.

The following general remarks upon mating and controlled serving may be of interest.

When bulls are run with the cows, each should be able to impregnate 25 to 30 cows. A yearling bull should not be allowed to run with the cows, but he should be allowed services at intervals and should not serve more than about 12 cows during the first service season.

Some cattlemen prefer to have the bulls with the cows during the day and to take them out for feeding at night. Others prefer the reverse, especially where the day temperatures are high. Yet another system provides 2 sets of bulls, each set running with the cows during alternate periods.

In order to facilitate handling and feeding, bull-stalls may be erected near watering places.

When hand or controlled serving is practised, it is better to keep the bull in control all the time and to adhere to the same

routine. If the bull is brought to the cows, he should be induced to serve immediately. Should he hesitate too long, or keep on mounting without completing the service, he should be taken away and brought back after say 10 to 15 minutes. Once bulls are spoilt they become slow and indifferent servers.

Controlled serving should be done in the early morning or late afternoon and not during the heat of the day.

A disadvantage of hand serving is that oestrus observations have to be made, and even if this is done with great care, very frequently cows exhibiting short oestrous periods of only a few hours are not discovered and consequently they are not served.

It is desired to impress the fact that the most important function of the bull depends upon the normal operation of a delicate set of organs the function of which may be impaired by disease or other adverse conditions such as malnutrition and exposure to extreme (especially high) temperatures, all of which can be prevented by good management.

Handling the Bull and Care of the Feet.

The bull calf should be taught to submit to proper handling whenever opportunity offers. No one should be allowed to play with a young bull; children especially should not push against his head in a trial of strength.

A bull should be kept in stalls and paddocks which are well constructed so that he will never break loose and realize his own strength.

Young bulls should be rung when they are about 10 months old. The operation is a simple one; it can be accomplished by putting two halters on the bulls head and securing his head to a conveniently situated crossbeam (see illustration). A self-piercing 2¾-inch ring should be used for bulls of 10 to 12 months of age.

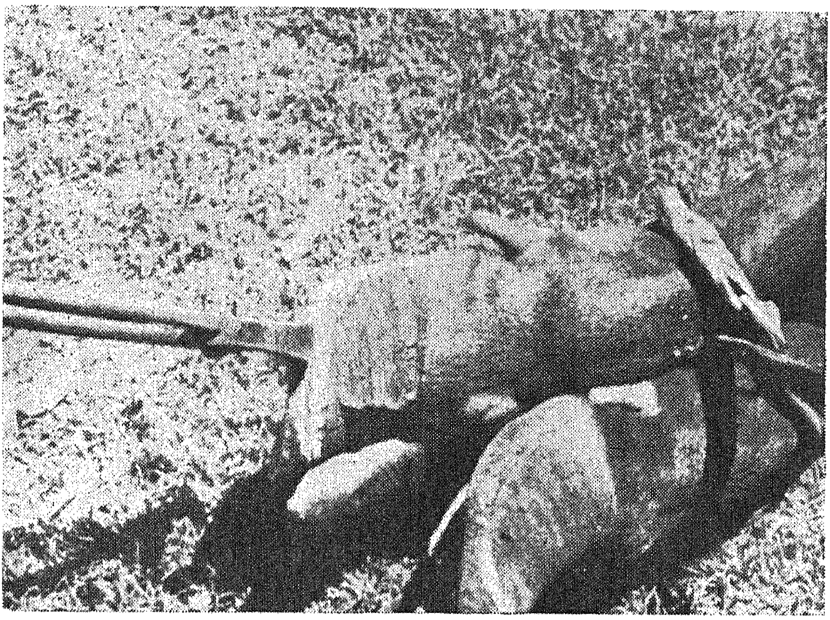
Older and stronger animals will have to be thrown to be rung; the Reuff's method of casting is preferred. Heavy bulls should be starved for 24 hours before being thrown. A running noose at the end of a 20-foot rope is put around the base of the horns or around the neck in the case of polled animals. A halfhitch is made round the chest and another round the abdomen immediately in front of the scrotum (see illustration). The rope is pulled to the rear of the animal and when it collapses, its feet should be secured. After securing the feet, the tension of the long rope may be eased. The animal should be watched in case there is danger of its becoming blown; in any case it is safe to limit the operation to 30 minutes.

When rings become worn they should be replaced at once. Two-year old bulls should be given larger rings.

Training, such as leading, should commence soon after weaning. The bull must be taught, when led by a halter, to walk naturally next to and not behind the attendant. When the bull is somewhat older it may be led by putting the loose end of the halter through the nose ring, but it is important that he should be led by the halter and not by the nose. The attendant should not hang on or pull the bull by the nose, but he should keep a firm grip on that portion of the rope which is attached to the head. The pull on the nose ring is used only to exercise special control over the animal.

When the bull becomes older and more difficult to control he should be led by means of bull-pole or bull-leader, which is about 6 feet long and somewhat thicker than a broom handle. It is fitted

at the one end with a catch in which the bull ring is held. This permits the stockman to handle the animal from a distance, also it can prevent the bull from charging. The leader is also used when exhibiting; the bull's head can be raised which has the effect of showing the animal to better advantage. On the other hand, some bulls walk with a strained and unnatural gait when held by a rigid bull-pole, consequently they will not show up well in the ring.



Badly grown feet being clipped.

When handling a bull which has no bull-ring, a bull-holder can be used. There are various types of bull-holders.

The hoofs of individual animals are inclined to grow long and misshapen. Insufficient exercise and soft ground also result in long feet.

Long and badly formed feet are a source of trouble, especially in the case of old and heavy bulls. Their activity is reduced, they tend to become fat and lazy. Even relatively young bulls are awkward and difficult servers when their feet are neglected.

The bull should be cast in order to permit the operator to trim the hoofs properly. If the operation takes much more than 30 minutes, the bull should be allowed to get up and rest.

The outer edge or horn of the feet should be clipped off with farrier's hoof cutters or nippers (see illustration). The bottom of the sole should then be pared with a knife and finished off with a rasp. Care should be taken not to cut into the " quick ".

Diseases.

Bulls should be maintained in good health at all times. A veterinary surgeon should be consulted if a serious condition of ill health is suspected.

Losses are particularly high in certain areas where tick-borne and other diseases occur. However, it is now possible to immunize against redwater, gallsickness, blackquarter, and anthrax. Heartwater still takes a heavy toll of bulls, especially those introduced from

non-heart-water areas. The heart-water tick can be controlled by regular dipping as advised by the Department.

It is recommended that, before being introduced into a herd, bulls should be subjected to the tuberculosis and contagious-abortion tests.

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Building Site for the Silo:—

[*Continued from page 292.*

and blower are obtainable at a reasonable price, the best plan would be to build a tower silo adjacent to the byre, but if this equipment is unprocurable it will be necessary to consider the construction of a convenient pit silo. In selecting a site for the silo, farmers sometimes allow themselves to be influenced solely by the saving in money and trouble in its construction and by the ease with which the silo can be filled or emptied, but it is a mistake to attach too much importance to this aspect of the matter. The greater cost of building a silo on the right spot, as explained above, will be amply repaid by the saving of transport and labour over a number of years. The unnecessary driving of stock from one place to another will also be eliminated. This saving of transport and labour will also compensate for implements which might sometimes be required. It is becoming increasingly necessary to save on labour since the labour problem is continually becoming more acute and labour costs are also evincing a tendency to rise. Where the silo is a comparatively permanent improvement on a farm, it is necessary to ensure that it is built on the most suitable site and that it is adapted to the farming system.

Milk-production Studies with Sheep.

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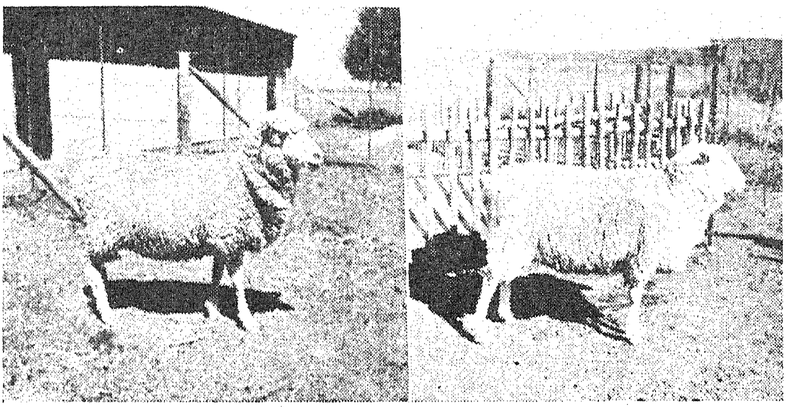
IN all farm animals where the newly born animal is not artificially reared, as in the case of the dairying calf, it is dependent upon the milk of its dam for adequate nourishment during the early stages of its life. The genetic or hereditary growth potentialities of live stock are predetermined at conception. The expression of the hereditary growth possibilities is, however, subject to the influence exerted by environmental agencies. The most important of these environmental



Merino. Border Leicester×Merino.

factors influencing the course of growth are the nutritional conditions to which the animal is subjected. Following conception the foetus is entirely dependent upon the intra uterine nourishment it receives. During the early stages after birth the further development of the inherent growth potentialities is primarily determined by the efficiency of the mothering qualities of the dam. Through selective breeding the hereditary growth rate of different types of live stock has been gradually changed. In our modern breeds of cattle, sheep and pigs bred for meat production the slogan of breeders has been to breed for "early maturity". The result has been an increase, genetically, in the growth stimulus amongst the various breeds of live stock. Since the hereditary aspect of growth cannot be divorced from the environmental aspect, it is obvious that any increase in the hereditary growth-rate of a breed must necessarily be accompanied by a corresponding improvement in the nutritional conditions in order to permit the optimum expression of its hereditary characteristics.

Environment and Nutrition.

A knowledge of the variations in the hereditary growth potentialities between breeds may thus be turned to useful account in the choice of different breeds for different types of farming enterprises depending upon the prevailing environmental conditions. From a practical point of view, growth will vary with different breeds within the same environment and with the same breed in different localities varying in climate, soil and nutritional conditions.

An analysis of all the factors which influence the development and growth of sheep will lead to a better understanding of the causes of variations and may thus bring about changes in the systems of

husbandry as practised in different parts of the country. Fat-lamb production under South African conditions has to be based not only on an understanding of the genetic breed differences, but also on the effects exerted by nutritional and other factors which influence the growth of sheep inherently. With the large number of factors involved in the environment and the extreme variaton which exists in the different parts of the country, it is evident that no fixed breeding policy which will be applicable to all parts of the country can be laid down. During recent years more information has become available in regard to the relative adaptability and merits of certain breeds and crosses of sheep under varying conditions in South Africa. It has also been shown that of all the environmental factors influencing growth and consequently production of fat-lambs the nutritional factor must be considered as of paramount importance.

The object in fat-lamb production is to produce a well finished "sucker lamb" of 60 to 70 lb. liveweight in 12 to 16 weeks. From the accumulated data it appears that the most important period of growth is that which takes place during the early suckling stage, and it is largely upon the development attained during this period that future progress depends. The successful production of fat lambs is primarily dependent upon the speed with which gains are made during the first few weeks after birth. Such growth is dependent upon the level of nutrition, which must be sufficiently high to promote fattening simultaneously with bone and muscle growth in order to produce a well-finished carcase at an early age.

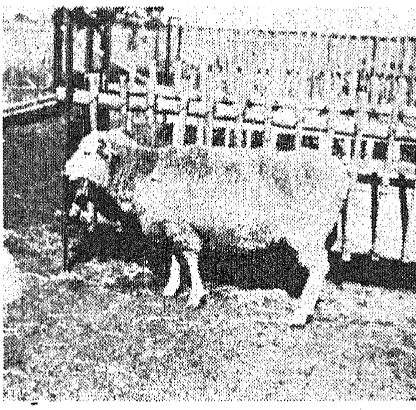
Hammond (1932) states: "It will be apparent from the difference in growth made by twins reared as twins and by twins reared as singles, that the milk supply of the dam is of the greatest importance, and that in order to obtain good growth of the lambs in early life, special selection of the ewes should be made for this purpose. It is of even more importance in sheep than in cattle or pigs, where fluid milk substitutes can be used in the rearing of the young animals. In practice it is found that a scarcity of milk at the beginning of a young lamb's life is fatal to its making good growth at any rate until late in the season. A shortness of milk causes the young lambs to grow more wool than meat, they become potbellied and unthrifty and are forced to eat larger quantities of other food which they cannot digest, with the above-mentioned results."

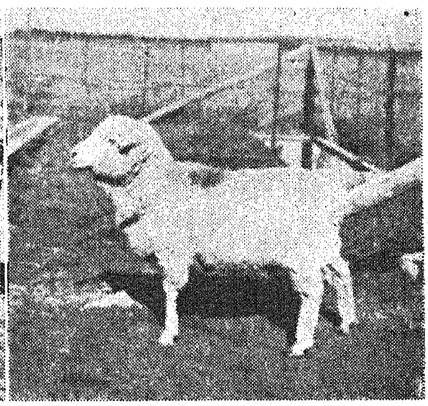
During the early stages of growth the most important limiting factor to rapid increase in the liveweight of suckling lambs is, no doubt, the lack of sufficient milk. *The relation of the quantitative production of milk by ewes to the success of fat-lamb production, is a matter of fundamental economic importance.* In the selection of the ewe stock for fat-lamb production, this basic principle is often overlooked by farmers who wish to embark on what is to them a new enterprise.

In an endeavour to improve the standard and quality of the fleece of Merino sheep many breeders have not given sufficient attention to the importance of the mothering qualities of ewes in the classing and selection of their flocks. The result has been that the average milk production of some Merino flocks has been gradually reduced to a level barely sufficient to meet the nutritional requirements of Merino lambs. This low level of milk production in many of the Merino flocks must be considered as one of the main factors responsible for the unsatisfactory crops of lambs reared annually in many Merino studs in South Africa. The Merino is a slow-maturing sheep in comparison with improved mutton breeds. The inherent rate of growth

of Merino lambs is considerably slower than that of lambs from recognised mutton breeds, consequently the detrimental effects of any deficiency in the milk production of the ewes are not so apparent as in the case of early maturing breeds of sheep.

It is apparent that the higher the hereditary level of milk production, the greater will be the nutritional demands of ewes if they are to express their optimum production. It may, therefore, be concluded that the successful production of fat lambs is dependent


Ile-de-France×Merino.


Ryeland×Merino.

fundamentally upon the use of the right type of ewe, that is to say, one which is capable of maintaining a high level of milk production under a system of farming which provides adequate food of high quality to meet increased nutritional demands. With an inherent low level of milk production, optimum nutritional conditions cannot force the level of production any higher than the limit of the hereditary potentialities. On the other hand, inadequate nutritional conditions will restrict the possible expression of the hereditary potential for the production of milk. In the case of a high-producing ewe, there will be a tendency to maintain the higher level of production at the expense of her body tissues when nutritional conditions are inadequate. A drop in condition follows, and consequently a disturbance in the normal physiological functioning of the animal body. This is frequently the cause of ewes failing to breed during the following mating season. In addition, the increased strain of suckling a lamb under deficient conditions of nutrition often results in a " break " in the wool.

Determining the Milk Production of Ewes.

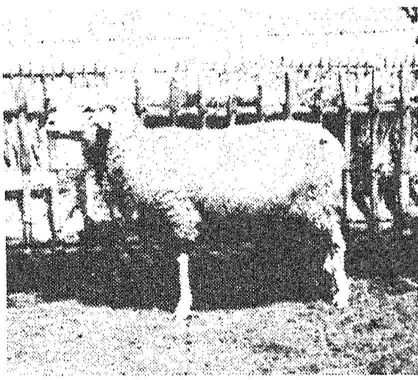
The present investigation is probably unique, in so far that it is the most extensive study in connection with the milk production of " non-milk " breeds of sheep on record.

The milk production in the case of the East-Friesian sheep has been studied by Scheingraber (1933) and Muhlberg (1936). A more recent investigation in connection with the milk production of sheep in Cyprus was conducted by Maule (1937). As the sheep used in the above researches were milk breeds of sheep, hand milking could be practised and proved satisfactory.

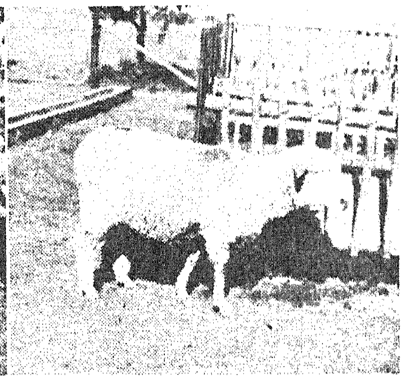
The information in connection with the milk production of " non-milk " breeds of sheep is, however, very meagre, due to the fact that the determination of the milk yields is far more laborious and difficult.

The most intensive investigation to date on quantitative production of non-milk sheep is that of Neidig and Iddings (1919) who studied the milk yields of three ewes from each of six different breeds. Pierce (1934) also determined the milk yield of six Merino ewes. In the present study the average milk yields for 9 different "breeds" were determined, and 323 twelve-week lactation records are included.

It is obvious that the determination of the milk yields in ewes cannot be obtained with the same degree of accuracy as in the case of animals kept for dairy purposes and which are regularly milked



Dorset Horn×Merino.



Romney Marsh×Merino.

by hand. When animals do not let their milk down readily when milked by hand, the most satisfactory method of obtaining their milk yield is by recording the differences in the weight of their young before and after suckling at regular intervals. This method has been successfully employed by Schmidt and Lauprecht (1926), Hempel (1928), Olofsson and Larsson (1930), Bonsma and Oosthuizen (1935), and Donald (1937) in the case of pigs.

The technique and procedure followed in the present investigation were briefly as follows: The lambs were separated from their dams once a week for 24 hours, and during this period they were allowed to suckle at 3-hour intervals from 6 a.m. until 12 o'clock midnight and again for the last time at 6 o'clock in the morning.

While the ewes were kept in pens during the 24-hour period they received additional supplementary feeding to compensate for the loss of grazing. Both ewes and lambs had free access to water.

The chief criticisms which may be levelled against this method of determining the milk yield are that the production of a single day was taken as being representative of the yield for the whole week and that the ewes were subjected to a different level of nutrition, management, etc., for the day on which the milk production was recorded. The lambs were watched carefully while suckling and were weighed in a basket immediately after suckling in order to avoid any possible error due to untimely excretions. The ewes were disturbed as little as possible when handling the lambs. Since these ewes were accustomed to frequent handling, as they were weighed regularly at weekly intervals and were frequently measured, it is doubtful whether the artificial conditions had any disturbing effect on their normal milk yield.

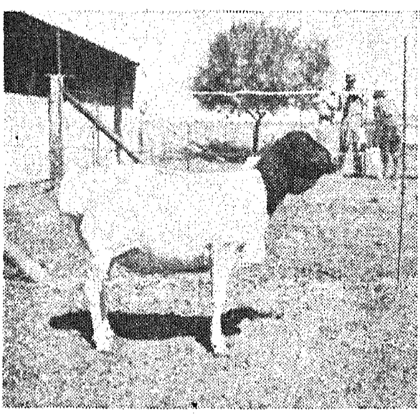
The statistical methods employed in the calculation of the total milk yields of the ewes over the 12-week period have been described in detail by Bonsma (1939). The formula used for calculating all

lactations in the present investigation was the following: Total milk yield $= \frac{7}{2}$ $(W_1 + 2W_2 \ldots\ldots\ldots 2W_{11} + W_{12})$, where W_1, W_2, etc. represents the actual 24-hour yields as recorded for successive weeks. A more reliable figure can be calculated statistically by using the above formula for estimating the yields for an 11-week lactation period than the simple method of assuming that the recorded yield represents the average daily yield for the particular week.

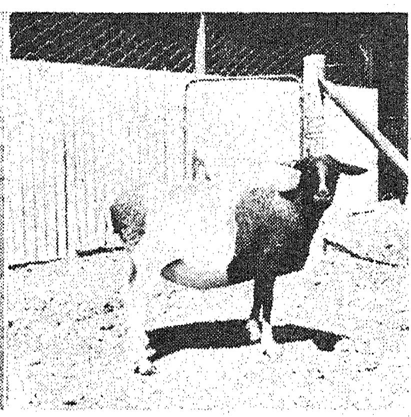
Objects of Investigation.

Fat-lamb production experiments have been in progress at the Agricultural Research Institute since 1931. During the first number of years crossbreeding was confined to the use of draft Merino ewes as a basis for fat-lamb production. Later this was followed by using Blackhead Persian ewes as the foundation stock.

The early results of crossbreeding with Merino ewes indicated that the milk production of ewes was probably one of the most important and fundamental factors influencing the growth and quality of the various crossbred lambs produced. The marked variation in the growth of lambs and the quality of the resulting carcases from the same cross confirmed the conclusion drawn from observations, namely that the comparative hereditary differences in the growth potentialities of the different crosses were obscured owing to the variations in the milk-producing qualities of individual ewes. In crossing merino ewes with various mutton rams it was found that the quality of the carcases of the progeny was primarily determined by the milk qualities of individual ewes. The limited milk yield of a large percentage of the ewes prevented the expression of the hereditary growth and consequently the mutton qualities of the crossbred lambs. The result was a considerable variation in the quality of the carcases produced within the same cross.



Blackhead Persian.



Dorset Horn×Blackhead Persian.

A detailed study of the milk yield of ewes was, therefore, considered of fundamental importance in conjunction with the comparative growth studies of different crossbred lambs. This aspect of the investigation was started in 1935. The results of the investigation of crossbreeding with Merino sheep up to the end of 1937 were published in detail by Bonsma (1939).

Since then a considerable amount of data has been accumulated in connection with the further development of this work.

This article, therefore, deals primarily with the milk production of different Merino and Blackhead Persian crossbred ewes and its influence upon the growth and development of fat lambs.

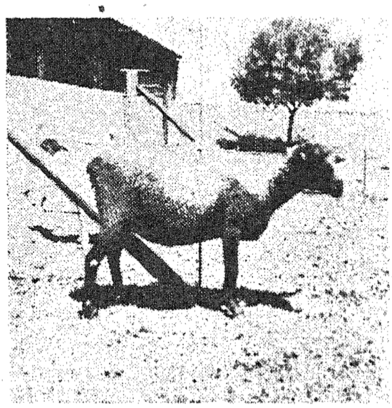
The objects of the investigation were, briefly, the following:—

1. To determine the milk yields, under similar nutritional conditions, of purebred Merino and Blackhead Persian ewes and to compare them with those of different crossbred ewes, produced by crossing these two breeds with various mutton rams.

2. To determine the relation between the milk production of ewes and the growth and quality of their lambs.

Nutritional Conditions.

The natural vegetation on the Experimental Farm is of poor quality and not well suited to sheep. During the summer months the ewes were rotationally grazed on plots of natural pasture. In order



Suffolk×Blackhead Persian.

to maintain a uniform and adequate level of nutrition as far as possible from year to year, liberal supplementary feeding was resorted to. As soon as a decline in the feeding value of the natural vegetation became apparent towards the latter part of summer, the ewes were given a supplementary ration consisting of lucerne hay and a grain mixture of crushed maize, rolled oats, bran and peanut cake. Two morgen of irrigated land were available for the production of root crops during summer and of winter cereals during winter. This was the only source of supplementary succulent fodder for the ewes and lambs. The weekly body-weight records of the ewes served as a guide to their condition, and as far as possible the nutritional conditions were maintained at more or less the same level from year to year.

The milk yields of the following breeds and crosses were determined:—

1. Purebred Merino.. (M)*
2. Purebred Blackhead Persian........................ (P)
3. Romney Marsh x Merino............................... (Ro)
4. Ryeland x Merino.. (Ry)
5. Border Leicester x Merino............................ (Bl)
6. Dorset Horn x Merino.................................. (DH)
7. Ile de France x Merino................................ (Fo)
8. Suffolk x Blackhead Persian......................... (PF)
9. Dorset Horn x Blackhead Persian.................. (PH)

* In the tabulation of data the symbols in brackets will be used to denote the various breeds and crosses.

Different rams from each mutton breed were used each year in order to minimise the effect of the individual excellence or otherwise of the rams used, and thus ensure a more reliable representation of the relative merit of the various breeds.

Total Milk Production.

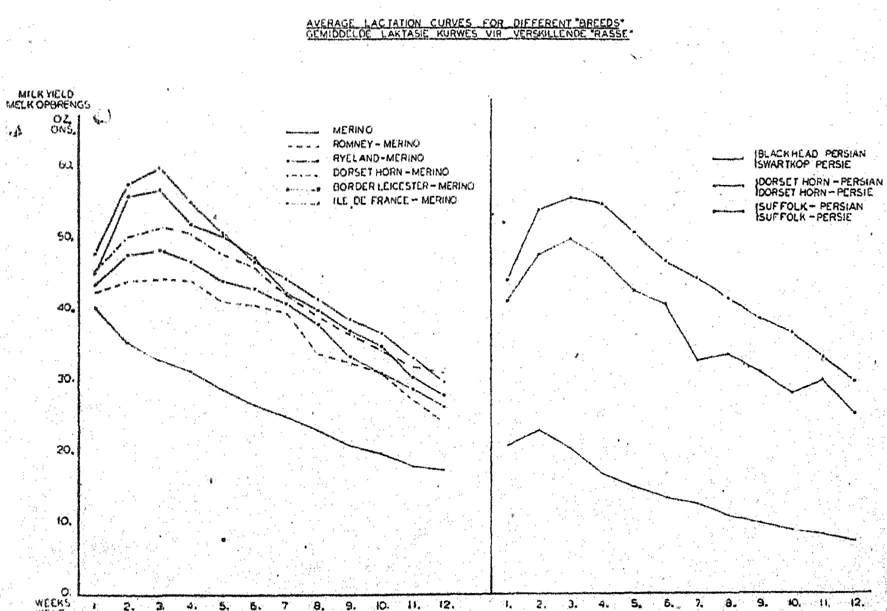
The average total milk production, calculated as described above for the various breeds and crosses, is tabulated in Table I.

TABLE I.—*Average Total Milk Yield for 11-week Lactation Period for Different Breeds and Crosses.*

Breed.	Number of Lactations Recorded.	Average Milk Yield in Ounces.	S.E.	Milk Yield expressed as Percentage of Production of Basic Breeds.
				%
1. Merino..................	88	2,039	± 68·0	100·0
2. Romney x Merino.......	24	2,890	±165·6	141·7
3. Ryeland x Merino.......	24	3,075	±177·7	150·8
4. Dorset Horn x Merino..	22	3,301	±181·9	161·9
5. Border Leicester x Merino	27	3,458	±171·8	169·6
6. Ile de France x Merino..	33	3,538	±122·8	173·5
7. Blackhead Persian.......	40	1,071	± 38·0	100·0
8. Suffolk x Blackhead Persian	22	2,632	±170·3	245·7
9. Dorset Horn x Blackhead Persian.............	43	3,314	±151·4	309·4

The results tabulated in Table I clearly indicate the marked increase in production recorded for the various Merino crossbred ewes as compared with the purebred Merino. The statistical analysis of the data (Analysis of Variance) reveals a significant ($P < \cdot 01$) difference between the milk yields of purebred Merino ewes and the

FIG. 1.



various Merino crossbred ewes. The increase in yield of Blackhead Persian crossbred ewes, as compared with purebred Blackhead Persian ewes, is even more striking and statistically insignificant ($P < \cdot 01$).

From the average yields tabulated in Table I there appears to be an appreciable difference in the milk yields between the various Merino crossbred ewes.

The statistical analysis of the data established a significant difference ($P < \cdot 05$) between the milk production of the Romney × Merino crosses and the Border Leicester and Dorset Horn crossbred ewes. The difference in production between the Ile de France × Merino and the Romney × Merino was significant ($P < \cdot 01$). No significant difference could be shown between the milk yields of the Romney × Merino and the Ryeland × Merino ewes. The differences between the Border Leicester, Dorset Horn, and Ile de France crossbred ewes were not significant.

An analysis of the data justified the conclusion that as far as milk production is concerned the three last-mentioned " breeds " have given the most satisfactory results.

The difference in the average yield of the Dorset Horn × Blackhead Persian and Suffolk × Blackhead Persian is significant($P < \cdot 01$) and proves the superiority of the first-mentioned cross,

The average daily milk yields, as recorded once every week for 12 successive weeks for all the different " breeds ", are given in Table II.

TABLE II.—*Average Daily Milk Yield in oz.*

Breed.	Weeks.											
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
M.	40·7	35·5	33·3	31·6	28·9	26·7	25·2	23·3	21·3	19·8	18·0	17·
Ro.	42·5	44·2	44·4	44·3	41·3	40·7	39·7	33·7	32·6	31·3	27·3	24·
Ry.	43·6	47·9	48·5	46·9	44·3	43·3	41·0	38·2	33·6	31·3	28·9	26·
D.H.	45·6	50·4	51·6	50·9	47·8	46·1	42·2	39·1	36·6	34·4	32·0	31·
B.L.	45·4	56·1	57·0	52·3	50·5	47·3	42·3	40·1	37·2	35·0	30·6	28·
Fo.	48·1	57·9	60·3	55·3	51·0	46·9	44·5	41·6	38·8	36·8	33·4	29·
P.	20·8	23·0	20·5	16·8	15·0	13·4	12·6	10·9	9·8	8·8	8·3	7·
P.F.	41·3	47·7	50·0	47·3	42·7	4019	32·9	33·6	31·3	28·2	30·1	25·
P.H.	44·2	54·2	55·9	55·2	52·5	47·6	44·6	41·6	36·7	31·9	30·2	27·

The lactation curves obtained from the data tabulated in Table II are shown in Fig. 1. This graphical presentation of the data reveals some very interesting features as to the differences in the shape of the various lactation curves which reflect the relative persistency in production between the various " breeds ". This aspect of the milk production of ewes has an important bearing upon the growth and development of lambs during the first few weeks following birth. It will be seen that there is an appreciable difference in the shape between the lactation curves of purebred Merino and Merino-crossbred ewes. A notable difference is revealed, in that the crossbred ewes reach their maximum production during the third to fourth week following parturition, whilst the average maximum production of the Merino ewes is recorded during the first week, followed by a steady decline thereafter. In the case of purebred Blackhead Persian ewes a slight increase in production is observed from the first to the second week after lambing. The Blackhead Persian crossbred ewes, on the other hand, show a steady increase and reach their maximum production during the third week following parturition.

The variation in the shape of the lactation curves and the time after lambing at which maximum milk production is reached are of great practical importance. In order to promote rapid growth and to meet the increasing maintenance requirements of the developing lambs it is essential that the dams should show a steady increase in the daily milk production during the first three weeks. During this period the lambs are practically entirely dependent for their nourishment upon the milk supply of their dams. In this respect the lactation curves of crossbred ewes show a very marked advantage over those of purebred Merino and Blackhead Persian ewes. Although no significant advantage could be established in the milk yield between the Ile de France, Border Leicester and Dorset Horn crossbred ewes, the use of the Dorset Horn and Ile de France rams for the breeding of Merino crossbred ewes is advocated in preference to the other mutton breeds.

Superior Crossbreds.

From the results of the experiments in progress at the Experiment Farm, the Dorset Horn and Ile de France crossbred ewes have proved superior to the remaining Merino crosses in respect of the following:—

(i) They have a more extended season of sexual activity and breed more regularly.

(ii) The highest lambing percentage was obtained for the Dorset Horn × Merino cross followed by the Ile de France cross.

(iii) The results of the climatological investigations indicate that the Dorset Horn and Ile de France are more adaptable to unfavourable climatic conditions than the Border Leicester or Romney Marsh.

(iv) Under the conditions prevailing on the Experiment Farm the mortality due to disease in these crosses was the lowest recorded for the different Merino crosses.

Unfortunately it is impossible to obtain any purebred Ile de France rams at present as there are no purebred breeders in the country and importation is out of the question owing to war conditions.

The results obtained with the Dorset Horn have, however, been so encouraging that its use for crossbreeding with Merino ewes can be advocated with confidence in those areas climatically suitable for the production of halfbred ewes.

The Inheritance of Milk Yield.

In the case of cattle, numerous authorities, Gowen (1920), Kildee and McCandlish (1916), Graves (1925), Turner (1927) and others have come to the conclusion that many genes of varying effect are involved in the inheritance of milk production. The evidence obtained by crossing breeds of different levels of production tends to indicate the presence of many factors exhibiting dominance for increased milk production.

The production of the F.1 offspring was found to be intermediate between the two parent breeds, but approaching more closely the level of milk production of the higher producing parent. The conclusion was drawn that the inheritance of milk yields appears to show partial dominance of high milk yield to low milk yield.

The results tabulated in Table I and the relation between the various lactation curves for the different purebred breeds of sheep and their crosses as shown in Fig. 1 leave little doubt as to the transmitting qualities for increased milk production of the mutton rams used for crossbreeding with the Merino and Blackhead Persian ewes.

From the significant increase in the quantitative production of the crossbred ewes, the conclusion seems to be justified that the increase in milk yield of the F.1 was due to the influence of dominant multiple factors. Unfortunately no data are available for the milk production of the purebred ewes belonging to the various mutton breeds used for crossbreeding with the Merino and Blackhead Persian. It is, therefore, impossible to ascertain to what extent the level of the increased production of the F.1 approaches more closely the level of production of the purebred mutton breeds which were used.

Further evidence of the prepotency of the mutton rams in transmitting an increase in the level of milk production is obtained from the available *dam-daughter comparisons*. From the available records it was possible to select 33 dam-daughter pairs. The details are given in Table III and are graphically shown in Fig. 2.

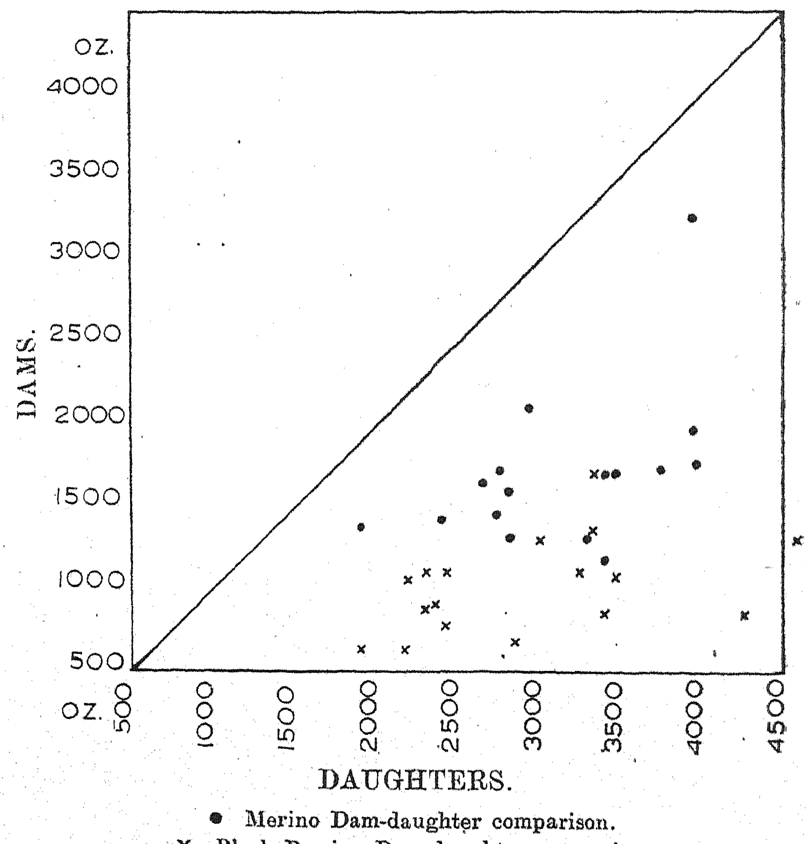


FIG. 2.

From the 16 Merino dam-daughter comparisons it will be seen that the crossbred daughters produced on an average 89·1 per cent. more milk than their Merino dams. In every instance an increase in production was recorded, varying from 21·2 per cent. to 190·3 per cent.

The 17 Blackhead Persian crossbred ewes produced on an average 199·3 per cent. more milk than their dams. The increase in milk yield varied considerably, ranging from 91·5 to 402·9 per cent.

The differences recorder in favour of the daughters become even more pronounced when it is taken into consideration that a number of records of the dams are second or third lactation records which are compared with first lactation records of their daughters.

In order to determine to what extent the level of production of the dams influenced the yield of their daughters, correlation coefficients for the dam-daughter comparisons were calculated. A non-significant correlation value of $r = \cdot 4816 \pm \cdot 198$ was obtained for the Merino dam-daughter comparisons. Similarly, in the case of the Blackhead Persian dam-daughter yields, a non-significant correlation of $r = \cdot 4067 \pm \cdot 209$ was established. From this and the foregoing conclusions it seems that the level of production of the crossbred ewes is primarily determined by the inherent level of milk production of the mutton rams used.

TABLE III.—*Dam-daughter Comparisons.*

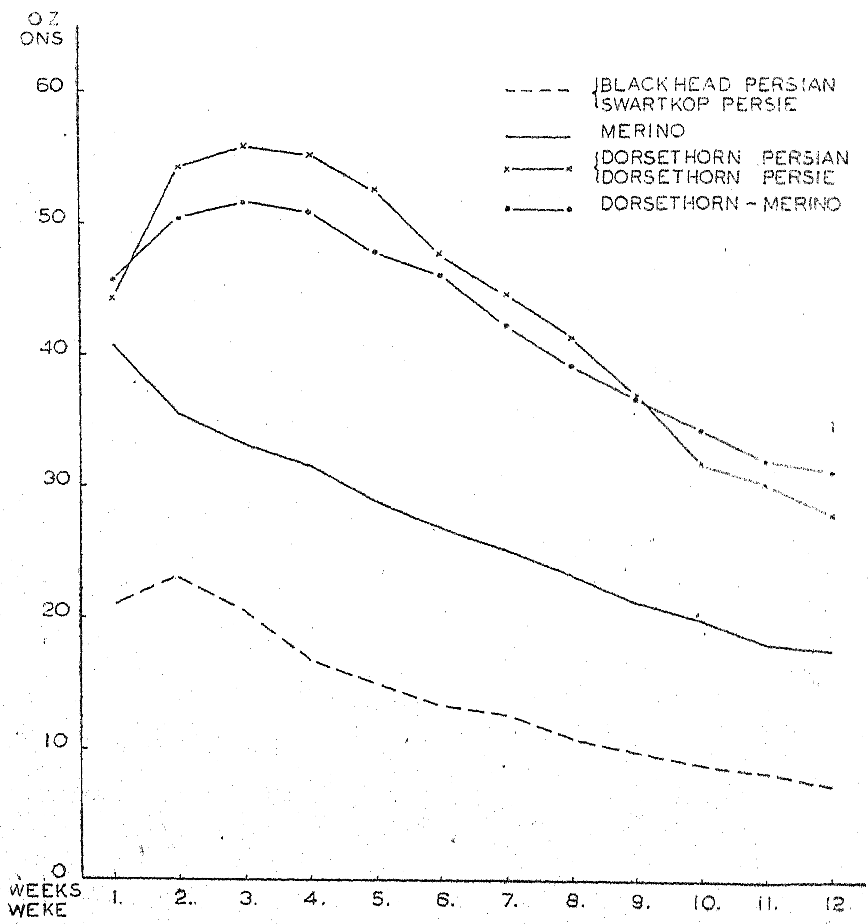
No. of Dam.	Milk Yield of Dam, in oz.	No. of Lactation.	No. of Daughter.	Milk Yield of Daughter. in oz.	No. of Lactation.	Increase in Milk Yield in oz.	Percentage Increase in Milk Yield.
Merino 88..........	1,765	3rd	Ry 7	3,981	3rd	2,216	125·5
" 192..........	1,620	2nd	Ry 4	2,801	2nd	1,181	72·9
" 39..........	1,710	2nd	Ry 3	3,440	2nd	1,730	101·2
" 64..........	1,425	2nd	Ry 37	2,408	1st	983	69·0
" 48..........	1,657	2nd	Ry 17	2,664	2nd	1,007	60·8
" 79..........	1,711	3rd	Ry 20	3,412	3rd	1,701	99·4
" 84..........	1,470	3rd	BL 29	2,740	1st	1,270	86·4
" 44..........	1,381	1st	BL 25	3,298	1st	1,917	138·8
" x5..........	1,733	2nd	BL 12	3,740	2nd	2,007	115·8
" 223..........	1,337	2nd	BL 4	2,813	1st	1,476	110·4
" 116..........	1,172	4th	Ro 10	3,403	2nd	2,231	190·3
" 44..........	1,381	1st	Ro 16	1,915	1st	534	38.7
" 285..........	1,734	1st	H 10	2,748	1st	1,014	58·5
" 87..........	3,247	3rd	H 13	3,935	2nd	688	21·2
" 36..........	1,977	1st	H 8	3,961	1st	1,984	100·4
" B14..........	2,155	1st	H 55	2,924	1st	769	35.7
	1,717·2			3,136·4		1,419·25	89·1
Persian 12..........	640	1st	PF 20	1,912	1st	1,272	198·8
" 13..........	1,104	3rd	PF 24	2,342	2nd	1,238	112·1
" 29..........	851	3rd	PF 23	4,280	2nd	3,429	402·9
" 12..........	640	1st	PH 23	2,188	1st	1,548	241·9
" 13..........	1,104	3rd	PH 40	2,456	1st	1,352	122·5
" 29..........	851	3rd	PH 9	3,432	2nd	2,581	303·3
" 48..........	1,100	3rd	PH 26	3,253	2nd	2,153	195·7
" 50..........	1,300	3rd	PH 5	4,591	3rd	3,291	253·2
" 50..........	1,300	3rd	PH 34	3,017	2nd	1,717	132·1
" 53..........	787	1st	PH 25	2,448	1st	1,661	211·0
" 58..........	1,068	3rd	PH 3	3,496	3rd	2,428	227·3
" 58..........	1,068	3rd	PH 22	2,214	1st	1,146	107·3
" 59..........	878	2nd	PH 28	2,355	1st	1,477	168·2
" 73..........	899	1st	PH 53	2,402	1st	1,503	167·2
" 75..........	1,757	1st	PH 47	3,366	1st	1,609	91·5
" 116..........	687	1st	PH 41	2,860	1st	2,173	316·3
" 126..........	1,398	1st	PH 38	3,302	1st	1,904	136·2
	1,025·4			2,936·1		1,910·7	199·3

Further evidence to this effect is obtained when the milk yields of the Dorset Horn × Merino and Dorset Horn × Blackhead Persian crossbred ewes are compared in relation to the average production of

the purebred basic breeds, as shown in Fig. 3. The average milk yields for the purebred breeds and the Dorset Horn crossbred ewes are as follows:—

Blackhead Persian	1,071 ± 38·0 oz.
Merino	2,039 ± 68·0 oz.
Dorset Horn x Blackhead Persian	3,314 ± 151·4 oz.
Dorset Horn x Merino	3,301 ± 181·9 oz.

It is interesting to note that although there exists a very significant difference ($P < \cdot 01$) in the average milk yield of the Blackhead Persian and Merino ewes, the average milk yield of the Dorset Horn crossbred ewes from these two breeds is identical.



AVERAGE DAILY MILK PRODUCTION.

FIG. 3.

Discussion of Results.

These results are rather unexpected, considering the marked difference in the average level of production between the Merino and Blackhead Persian. The remarkable increase in milk yield of the Dorset Horn x Blackhead Persian cross must be attributed primarily to the influence extended by desirable dominant factors for increased

milk yield. These results do not seem to be entirely in accordance with the generally accepted view held by Gowen (1920) and others in the case of cattle, in so far, that high milk production is partially dominant and that the level of production of the F.1 is intermediate between the two parent breeds, but approaches the level of production of the higher producing breed more closely.

Another factor which may partially account for the more marked increase in production of the Blackhead Persian crossbred ewes as compared with the Merino crossbred ewes, is the greater degree of heterosis observed in the first-mentioned cross. The extreme variation in the breed characteristics of the Dorset Horn and the Blackhead Persian produced an F.1 cross possessing the desirable inherent hardy qualities of the Blackhead Persian and the superior mutton and milk producing characteristics of the Dorset Horn. By crossing the Dorset Horn and Blackhead Persian a fenotype was produced which was more adaptable to the prevailing environmental conditions and thus had the advantage of expressing its milk-producing potentialities more fully.

From the foregoing discussion of the results in connection with the increase in milk production of the F.1 generation the conclusion seems justified that the increase in the milk yields of the crossbred ewes is due to the influence exerted by the larger number of dominant factors (responsible for the inheritance of high milk production) contributed by the purebred mutton rams.

The results further prove that the purebred mutton breeds recommended for crossbreeding must possess a high degree of homozygosity for the factors responsible for their comparatively high level of milk production.

Owing to its hardiness and high milking qualities the Dorset Horn × Blackhead Persian cross has proved an ideal crossbred ewe for the production of first grade fat lambs when crossed with the Southdown. The carcases produced from this top-cross have been equal in carcase measurements and quality to those of representative samples of New Zealand Canterbury lambs examined by the writer in 1938 at Smithfiled.

Recommendations.

The Dorset Horn × Blackhead Persian crossbred ewe must be considered the most suitable type of ewe for the production of fat lambs in those areas of South Africa where climatic and nutritional conditions are not favourable for combining the production of sucker lambs with that of crossbred wool. This cross can be recommended without hesitation wherever conditions for its production are favourable.

The imported purebred mutton breeds of sheep were developed under intensive farming conditions in a cool temperate climate, in a country famous for its evergreen grasslands. It is, therefore, not surprising to find that these purebred mutton breeds are not adaptable to the hot extensive semi-arid farming regions of the north-western Cape Province. The use of purebred Dorset Horn rams for the production of halfbred ewes in this area is, therefore, not feasible from a practical farming point of view. This area is, however, well suited to and maintains a large Blackhead Persian and Afrikander sheep population. Economically these sheep can only be used as slaughter sheep and as such must be improved in their mutton qualities through crossbreeding.

As a result of the hybrid vigour exhibited by the Dorset Horn × Blackhead Persian cross an active and hardy sheep, which is well adapted to the more extensive and arid regions of South Africa,

is being produced. Consequently the use of halfbred Dorset Horn-Blackhead Persian rams has been advocated for the improvement of the native sheep in these areas, the ultimate object being the production of suitable crossbred ewes for the production of fat lambs. These cross bred ewes can then be sold to farmers in areas of more intensive agriculture with irrigable land available where they will be crossed with the Southdown for the production of fat lambs.

Because of the hybrid vigour exhibited by the Dorset Horn-Blackhead Persian cross, which is largely due to the recombination of dominant factors, the use of halfbred rams must obviously result in a very marked degree of segregation in the next and following generations. The study in connection with the milk production of the Dorset Horn-Blackhead Persian crossbred ewes provides ample proof of the influence exerted by dominant multiple factors. From the results of the investigations carried out by Ritzmann and Davenport (1920) it appeared that the mutton characteristics in sheep are partially dominant over the non-mutton qualities. The large number of body and carcase measurements made in connection with the fat-lamb production experiments in progress provides conclusive support of the partial dominance of the mutton characteristics in sheep. (Bonsma, 1939.)

By using first cross Dorset Horn x Blackhead Persian rams segregation must be expected, not only in respect of the milk yield of ewes, but also in conformation. Fenotypical selection according to conformational mutton characteristics provides no assurance as to the potential milk-producing qualities of ewes produced from first cross rams. Farmers on expensive irrigation land can ill afford to purchase crossbred ewes producing insufficient milk to produce a well finished sucker lamb in 16 to 18 weeks. Owing to the prepotency of the purebred Dorset Horn and the high degree of hybrid vigour exhibited in the Dorset Horn x Blackhead Persian cross, attractive looking halfbred rams can still be bred from inferior quality ewes. Herein lies a very great danger, in so far, that breeders of halfbred rams will tend to ignore the standard of excellence of the purebred Blackhead Persian ewes used for crossbreeding. Little or no attention can be paid to the milking qualities of the Blackhead Persian ewes used for breeding halfbred rams. Every precaution should, however, be taken in the selection of the ewes used for this purpose and farmers who wish to use halfbred rams are well advised to use rams bred only from purebred Blackhead Persian ewes of a high standard possessing good mothering qualities. It is fully realised that until such time as a true-breeding mutton breed of sheep, which by virtue of its hereditary constitution, will be capable of thriving under the prevailing environmental conditions of the semi-arid regions of the north-western Cape Province has been evolved, the use of crossbred rams is probably the only method of improving the mutton qualities of the present inferior flocks of sheep in these areas.

The policy of using halfbred rams should, however, be considered as a temporary measure during the transition period, since it is one which will not lead to the production of uniformity in the breeding of crossbred ewes.

The creation of a hardy, non-wooled mutton breed, combining the desired mutton and milking qualities with hardiness in accordance with the prevailing conditions in different parts of the country, should receive the concentrated attention of our experimental stations. Only when the production of halfbred ewes in these areas is based upon the use of purebred rams can uniformity, similar to the results obtained in the present investigation with the use of the pure-

 [Continued on page 328.

Leaf Analysis of Citrus.

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IN response to an article " New Method for Estimating the Fertilizer Requirements of Citrus Trees " in *Farming in South Africa*, (May 1943) the writer received enquiries from some fifty citrus growers, most of whom sent one or more leaf-samples for analysis. As a result of these leaf analysis, suggestions as to changing the fertilizer programme were made in many cases—though it is naturally still too soon to find out what responses, if any, have resulted where such suggestions were followed. To change the chemical make-up of a tree is indeed a very slow process in most cases, and the value of leaf-analysis methods lies more in the prevention than in the cure of injury. Nevertheless, it may not perhaps be out of place to review, briefly, the results of the past season's work.

Nitrogen.

As might have been expected from the prevailing fertilizer shortage, one of the most noticeable features was the relatively low content of nitrogen of most of the samples sent in. It is realised that in most cases the growers were aware that nitrogen in some form was needed, but had just not got sufficient to give what the trees required. At the same time growers who sent samples from several different groves were informed which were highest and which lowest in nitrogen—thus indicating which groves appeared to need it most urgently, and helping them to distribute their available fertilizer to the best advantage. In a few cases leaves with an exceptionally high nitrogen content were sent in, indicating that excessive amounts of manure or nitrogen fertilizer had been applied in the past. In such cases the suggestion that nitrogen fertilizers could well be dispensed with for one or two seasons could hardly fail to be of value to the particular growers concerned. Incidentally, the application of some plantfood which is already being amply absorbed by the tree may not only be wasteful, but definitely harmful, since there will be a tendency to reduce the absorption of some other plantfood, possibly already rather deficient in the soil.

Phosphorus.

Only two instances occurred where a phosphorus deficiency appeared likely. Indeed, in several cases very high amounts of phosphorus were found in the leaves, almost invariably associated with a low nitrogen content, thus supporting the conclusion that nitrogen was probably needed, and that the use of superphosphates or sumilar fertiliers would almost certainly be wasteful.

Calcium.

Very low amounts of calcium (the main constituent of lime) were found in a number of samples—usually from rather old trees. Growers stated that the trees were yellowed, but failed to respond to manures or artificials. It seems to be the general experience throughout the world that to increase the calcium absorption of the tree is a slow and difficult matter. The most promising method is to apply either lime (on acid soils) or gypsum (on alkaline soils) in the hope that the trees may respond eventually. The case of calcium deficiency in citrus is a good example of where an ounce of prevention may be worth a pound of cure.

Magnesium.

A few samples were received containing very low amounts of magnesium. Such leaves are usually yellowed or "bronzed", with the exception of a green triangle at the base of the leaf. Trees in the Nelspruit area, where this trouble is common, have responded well to sprays containing magnesium compounds (see article by J. I. de Villiers, *Farming in South Africa*, May 1942, page 337). Soil applications of magnesite (magnesium carbonate) or epsom salts (magnesium sulphate) may also be expected to help eventually, though improvement may take several years.

Sulphur.

Only one case suggesting a sulphur deficiency was found. though in a few instances extremely high concentrations of sulphur were found, especially where nitrogen was lacking. It seems that where nitrates are low the plant tends to absorb excessive amounts of either phosphorus or sulphur. In the latter case yields appear to be affected very adversely. The remedy in such cases would seem to lie in the application of nitrogenous fertilizers and the greater use of brak-free manure, guano or compost.

"Lime-induced Chlorosis."

This physiological disturbance in citrus is recognised by a distinctive and typical yellowing of the leaves, and one or two cases of this trouble were diagnosed from the lime belt near the Orange River. The harmful effect upon citrus of an excess of lime is thought to be due to its action in changing the iron in the tree into an unavailable form. Such a condition is rather difficult to correct economically, but recent evidence from California shows that severe damage only occurs if such soils are over-irrigated, and that an occasional drying-out will do much to alleviate injury. Sprays and injections of iron compounds may also be helpful in certain cases.

Potash.

In only one instance was the potash content of the leaf so low as to suggest a deficiency. It appears that the potash in nearly all soils is ample for the needs of citrus. In several cases, however, extremely high potash concentrations were found in the leaves, nearly always associated with correspondingly low amounts of either or both calcium and magnesium. In such cases applications of calcium or magnesium compounds seem clearly indicated.

"Brak."

Excessive concentrations of chloride (one of the main constituents of "brak" salts) were found in a few samples. Where the chloride content was higher in the leaves from the poorer than from the better trees, there was little trouble in diagnosing brak injury. In such cases karroo-manure should be avoided, since this often contains large quantities of brak salts. It is preferable, too, for the grower to test his irrigation water from time to time (a simple chemical test), and never to apply it when the chloride content is found to be too high. Where brak is a danger, basin irrigation is to be preferred to furrow irrigation, since the latter system favours the accumulation of brak salts between the furrows. The use of gypsum can also be recommended in many cases. An occasional flooding of the lighter soils, when relatively pure water is available, helps greatly to wash out harmful accumulations of salts.

"Minor" or "Trace" Elements.

The so-called "minor" or "trace" elements—iron, manganese, zinc, copper, boron, and perhaps a few others, are not of minor *importance* to plant life, since they are equally as important as nitrogen or phosphorus for example, but are found in plants in relatively minor *concentrations*. The name "Trace Element" is therefore generally to be preferred.

Zinc deficiency occurs quite commonly in citrus as "mottle leaf", and is easier to diagnose from the appearance of the leaf than by chemical analysis. Zinc sprays are usually a cheap, rapid, and very successful method of cure, as many growers in the eastern Cape Province can testify.

The symptoms of manganese deficiency are somewhat similar, but can usually be diagnosed fairly well by means of plant analysis. A few such examples were sent in, and manganese sprays recommended as a cure in such cases.

Two cases of a probable deficiency of copper were found—one from the Muden area in Natal, and the other from the Willowmore district. Fruit sent in from the latter area had the typical corky lesions of the rind that are found in such cases. Copper sprays or soil applications of bluestone can be expected to cure the disease quite rapidly.

Boron deficiency seems to be very uncommon in the Union, and only one case suggesting it was found. In Southern Rhodesia, however, it was for many years a very serious trouble till diagnosed and cured by the simple method of giving each tree a few ounces of borax or boracic acid. One or two samples contained excessive amounts of Boron, suggesting actual injury to the trees from the absorption of harmful quantities. Such cases were at one time quite common in the United States of America, due to contaminated or naturally unsuitable irrigation water.

An interesting sample was received from a grower in the Grahamstown area. Here the leaves, which were rather a pale lemon colour, were abnormally high in manganese, and at the same time rather low in iron. Here again it seems that the functions of iron in the tree are being interfered with by the excessive amounts of manganese in the soil and tree. Certain soils in Hawaii are so high in manganese that for many years the cultivation of pineapples was unprofitable, till it was found that this was due to the effect of the manganese on the iron. Iron sprays were found to remedy the position, and have been a routine operation on these soils ever since.

"Organics or Inorganics?"

Many of the recommendations given above will probably be looked upon with horror by those followers of Sir Algert Howard who believe that "artificials" (a term which has never been satisfactorily defined) are one and all harmful to soils and plant-life. The writer, however, must place himself wholly on the side of the "orthodox" school which willingly concedes the value of composts and natural manures, but maintains that "artificials" in addition, *correctly* used, are often, useful, or indeed essential, under certain circumstances. The correct use of artificials is admittedly a far trickier business than the correct use of compost or manure. None the less, the writer does not believe that "the use of artificials is harmful". The *mis-use* of artificials can certainly be very harmful, but that is quite a different matter. Only by using one's experience and

powers of observations, by enlisting the help of chemical methods and, probably most promising of all, by "foliar diagnosis" or "plant analysis" methods, can artificials be used to their best advantage.

In conclusion, it may be of interest to quote from page 112 of "The Waste Products of Agriculture" by Howard and Wad:—

"The full possibilities of humus will only appear when the dressings of compost are supplemented by the use of suitable artificials. The combination of the two, applied at the right moment and in proper proportions, will open the door to the intensive crop production of the future. Humus and artificials will supplement one another. Further, the artificials must not be confined to those which merely supply nitrogen, phosphates and potash."

With these sentiments the writer finds himself in complete agreement.

Milk-production Studies with Sheep:—

[Continued from page 324.

bred imported mutton breeds and more in particular with the Dorset Horn, be expected.

N.B.—A second article will follow dealing with the influence of milk-yield of Ewes on the growth of Lambs.

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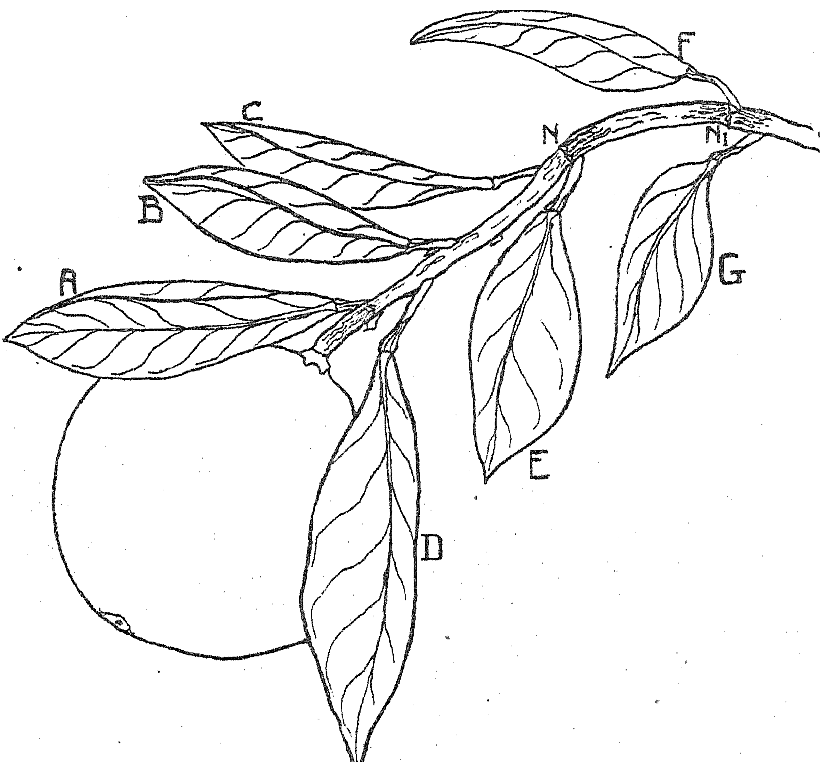
Method of Sampling Citrus Leaves for Diagnosis Purposes.

A. C. Bathurst, Division of Horticulture, Pretoria.

THE use of leaf-analysis methods as a means of controlling crop nutrition appears to be gaining favour throughout the world, and the writer has been gratified to receive numerous enquiries from all parts of the country in response to a previous article on this subject in *Farming in South Africa* (May 1943). However, from



A, B, C and D are spring-flush leaves, and correct for sampling. E, F and G are from previous flushes and *incorrect for sampling*. N is the node from which the spring flush commenced. N_1 is the node from which an older flush started, probably the previous autumn.

many of the queries received, it seems, that the method of leaf-sampling was not sufficiently clearly explained, and it is hoped that the following outline and diagram will make the method plain.

Selection of Trees for Sampling.

No results of any value can possibly be expected from leaf-analysis unless the sample sent adequately represents the trees about which information is required. Within reasonable limits, the larger the number of trees sampled and the greater the number of leaves sent, the better. In an orchard of, say, one thousand trees, it would be advisable to sample at least fifty, such trees being selected as representative of the block as a whole. If such trees are marked

for future reference, so much the better. In most cases it is advisable to send in two samples—one from those trees which appear to be the healthiest, and the second from those which appear the least vigorous. A comparison of these two samples is more likely to indicate any possible malnutrition than could be obtained from a single analysis.

Selection of Leaves on the Tree.

Leaves should be picked only from that growth-flush which occurred at the time of setting of the main crop—that is, leaves that were formed in early spring, or July to September in South Africa. To avoid uncertainty in locating such leaves later in the season it has been found preferable to select only leaves closely adjacent to in-season fruit, as indicated in the accompanying diagram by leaves marked A, B, C and D. Care must be taken not to include leaves such as E, F and G from below the node which indicates the point where the spring growth started (marked N in diagram). It is also preferable to take leaves from all around the tree, and not from any one particular point. In some cases it may be difficult to find more than a few leaves on any tree that answer to this description. Nevertheless, there should be little trouble in obtaining a good sample if a sufficient number of trees are included.

Time of Sampling.

The relatively rapid fluctuations in leaf composition that occur during the spring and summer months suggest the advisability of sampling during the winter, preferably May to July, after any autumn growth has ceased, but before the swelling of the spring buds starts.

Size and Treatment of Samples.

The minimum sample required for a complete analysis is about one-quarter pound weight of fresh leaves, which would weigh, say, two ounces when dried.

The proper cleaning of leaves once they are dry is not an easy matter, so growers are requested to clean each sample thoroughly before despatch. This may be done very easily by wiping each leaf free of dust, etc., with clean, dry, cotton-wool or similar material. The leaves may then be dried by spreading them out in a dust-free place for a day or two.

Particulars Required.

The following particulars should, if possible, be sent with each sample:—

(*a*) Variety of tree, (*b*) rootstock, (*c*) date of planting, (*d*) any symptoms of decline or abnormality, (*e*) source of irrigation water, (*f*) fertilizer and spray treatments in the past, (*g*) description of soil (and subsoil if possible), (*h*) any other relevant information.

Analyses of leaf-samples are made free of charge, and growers are placed under no obligation to carry out any suggestions that may be made. At the same time, where suggestions are followed, it will be much appreciated if growers will, in due course, inform this office of any responses to treatment.

Samples and any communications should be addressed to the Chief, Division of Horticulture, P.O. Box 994, Pretoria.

Choline and Nicotinic Acid in Poultry Rations.

A. M. Gericke, Department of Poultry Breeding, Agricultural Research Institute, Pretoria.

IN 1937 it was shown by Norris and collaborators that manganese is an essential mineral in the prevention of perosis or slipped tendon in chicks. Manganese is particularly important if the rations contain an excess of calcium and phosphorus. In 1940 Jukes fed rations containing sufficient manganese to poults, but in spite of this the birds developed perosis. In various experiments Jukes then proved that choline is just as important as manganese in the prevention of perosis. Consequently, choline is regarded as an important vitamin in the rations of chicks and poults.

In order to balance rations in respect of their choline content, a knowledge of the occurrence of choline in different feeds is essential. According to the analyses made by Rhian and collaborators in 1943, liver meal, fish meal and soybean meal are the best sources of choline. Ox liver contains as much as 11 milligrammes per gramme, while fish meal and soybean meal contain about 4·1 and 3·1 milligrammes per gramme, respectively. In the Union fishmeal and soybean meal are the obvious sources of choline, since liver is not available for animal feeding. Meat meal and groundnut meal have a lower choline content than soybean meal. If meat meal, for example, is used as the sole source of concentrated protein in a chicken ration, it is possible that the ration will contain too little choline, and that perosis will result. This is particularly the case when rations consist principally of carcase meal and wheaten by-products.

Heavy-breed chicks are subject to perosis to a greater extent than light-breed chicks. This abnormality of the leg is also frequently found in poults. Once a young bird has developed perosis, it never recovers. In most cases the birds cannot move about properly, and are often trampled upon by the healthy chicks around the feed hopper. It is, therefore, important that the rations should contain adequate quantities of choline to meet the requirements of young growing birds.

In 1941 Jukes found that poults grow quite normally when fed on a ration containing 0·2 per cent. of choline. Perosis occurred, however, in birds fed on the rations of Evans and collaborators (1942), which were deficient in either choline or manganese. The latter workers found that 15 per cent. liver meal in the ration completely prevented perosis, while 15 per cent. soybean meal or 13 per cent. fish meal gave only partial protection to poults. Recently (1943) Evans suggested that a ration should contain between 0·18 and 0·25 per cent., or approximately 19 per cent. choline to prevent perosis in poults.

A choline deficiency not only causes perosis, but also prevents normal fat metabolism, with the result that the animal may consequently develop a fatty liver. This is particularly liable to happen when a ration with a choline deficiency also has a high nicotinic acid content. Since nicotinic acid is in no way connected with the nicotine which occurs in tobacco, Griggs suggested in 1942 that the term "nicotinic acid" should be changed to "niacin" in order to avoid confusion.

Rats can synthesize the nicotine present in tobacco into nicotinic acid in their bodies, but it has not yet been proved that chicks can also do so.

According to the analyses of Hale and collaborators (1942), wheaten bran, brewers' yeast and liver are the best sources of nicotinic acid. It has already been mentioned above that a high percentage of nicotinic acid in the ration might cause a fatty liver. Since nicotinic acid counteracts the effect of choline, the question arises why a source of this acid should be included in a ration. The answer is that chicks apparently require a minimum quantity of nicotinic acid in their ration.

The work of Dann and Handler (1941) indicates that the embryo chick is actually able to synthesize nicotinic acid, but recently (1942) Briggs and collaborators found that chicks fed on rations containing only 0·3 milligramme of nicotinic acid per 100 grammes of feed, developed inflammation of the beak, crop and tip of the tongue. When 1·5 to 2 milligrammes of nicotinic acid per 100 grammes of feed was given, the birds grew normally. In further research work (1943) Briggs found that the nicotinic acid content of the pectoral muscles increased 15 times after an excess of nicotinic acid had been added to the feed (10 mgms. per 100 gms. of feed). The probability exists that, as soon as the pectoral muscles contain the optimum amount of nicotinic acid, further storage takes place in the liver. In the same experiment Briggs clearly showed that on a synthetic ration the young chick can synthesize about one-sixth of its total nicotinic acid requirements. The other five-sixths must be provided by the ration.

On the deficient rations given by Briggs, the chicks developed perosis, as well as dermatitis. This proved that both nicotinic acid and choline are necessary for the prevention of perosis in chicks. It is also probable that pantothenic acid is not the only factor of the vitamin B complex which prevents dermatitis in chicks.

Own Experiments.

In order to provide further information in this connection the rations fed to chicks on the experiment farm during the past two years are given: 45 lb. yellow mealiemeal, 15 lb. wheaten bran, 10 lb. ground wheat, 7 lb. lucerne meal, 8 lb. meat meal, 6 lb. white fish meal, 6 lb. baked soybean meal, 3 lb. brewers' yeast, 10 lb. maize germ meal, 1 lb. fine salt, 1 lb. limestone powder, 10 grammes manganese sulphate, and 4 ounces fish oil. The compositon of the ration calculated on a basis of 100 lb. is as follows: 6 fibre, 4·4 fat, 20·3 crude protein, 1·62 calcium (Ca), 0·97 phosphorus (P), 360 gamma riboflavin, 1,290 gamma pantothenic acid, 100 milligrammes choline, 8·0 milligrammes nicotinic acid. With large numbers of chicks this ration gave very good results, except that the groups of chicks hatched weekly from the middle of September to 10 October, often developed dermatitis. During warm weather conditions some of the chicks are listless, and probably do not consume sufficient feed to promote growth.

During the growing season it often happened that wheaten bran was not available. In such cases it was necessary to substitute a higher percentage of mealiemeal for the bran. Since wheaten bran is a good source of nicotinic acid and also gives the feed a good texture, thereby promoting the feed consumption, the substitution of mealiemeal for wheaten bran might explain why dermatitis was more prevalent in some groups than in others.

It is generaly accepted that chicks should be given mash only, until they are at least four weeks old, since, if coarser feed like crushed yellow maize or wheat is fed together with the mash, they will be so selective in their feeding, that even on a well-balanced mash the intake of proteins, minerals and vitamins is so limited, that nutritional deficiencies might occur.

It must also be pointed out in this connection that, unless sound management in respect of room temperature and hopper space is applied, a well-balanced ration will not necessarily give the desired results.

Diseases which arise as a result of a vitamin deficiency are for practical purposes diagnosed according to abnormalities which develop in specific parts of the body. So, for example, a riboflavin deficiency will cause paralysis of the toes in some chicks at the age of 3 to 4 weeks, while a pantothenic acid deficiency will result in dermatitis in others. In spite of the fact, however, that the symptoms of a specific vitamin deficiency are manifested only in certain parts of the body, Handler and Berheim (1943) pointed out that a general retardation in the growth of the bird takes place. They state, for example, that the development of a fatty liver in rats as a result of a choline deficiency in the ration can occur only when other nutritional factors arrest the growth of the rat.

Protein-rich Rations.

Since most of the research work hitherto carried out had been done with synthetic ration, it has not yet been definitely established what the choline and nicotinic acid content of practical chick rations and laying rations should be. At the Agricultural Research Institute various experiments were conducted with soybean meal, fish meal and meat meal as sources of protein. In 1940 eight different rations were fed to 8 groups of White Leghorn chicks. The choline content of the rations varied from 72 to 139 milligrammes and the nicotinic acid content from 5·9 to 6·6 milligrammes per 100 grammes of feed. Owing to the difference in the sources of protein and riboflavin there were considerable differences in the weights of the chicks at 8 weeks, but no abnormalities occurred. In 1941 and 1942 similar experiments were carried out. The choline content of the different rations varied from 105 to 123 milligrammes and the nicotinic acid content from 5 to 6·6 milligrammes per 100 grammes of feed. The cockerels and pullets fed on the control ration weighed 649 grammes and 546 grammes respectively, at the age of 8 weeks. In these experiments, too, no abnormalities of the legs occurred. The general conclusion is that good results can be obtained with practical chicken rations if the choline content of the ration varies from 90 to 130 milligrammes and the nicotinic acid content from 6 to 8 milligrammes per 100 grammes of feed. To promote optimum growth it is desirable that, if the ration consists mainly of mealiemeal (50 per cent. or more), fish meal and soybean meal from 10 to 20 per cent. of wheaten bran should be added.

The choline and nicotinic acid requirements of young fowls and laying hens have not yet been determined. It will be interesting to compare the laying rations fed in 1941 and 1942, respectively, to 8 different groups of White Leghorns. Both mash and whole grain (yellow maize) were fed. The composition of the mash is given in Tables I and II. The calculated vitamin content of the rations, the egg production and percentage mortality are given in Tables III and IV.

TABLE I.—*Composition of Mash in* 1941.

Feed Constituents.	Groups. 1.	2.	3.	4.	5.	6.	7.	8.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Wheaten bran	20	20	20	20	20	20	20	20
Pollard	20	20	20	20	20	20	20	20
Yellow mealiemeal	40	40	40	40	40	40	40	40
Ground oats	10	10	10	10	10	10	10	10
Lucerne meal	5	5	5	5	5	5	5	5
Brewers' yeast	3	3	3	green feed	3	3	3	3
Meat meal	20	14	10	11	7	—	—	—
Bone meal	2¼	3½	4¼	4¼	4¾	6	6	6
Oystershell powder	1¼	1¼	1¼	1¼	1½	1½	1½	1½
Raw soybean meal	—	14	22	24	30	44	44	—
Baked soybean meal	—	—	—	—	—	—	—	35
Fine salt	1	1	1	1	1	1	1	1

TABLE II.—*Composition of Mash in* 1942.

Feed Constituents.	Groups. 1.	2.	3.	4.	5.	6.	7.	8.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Yellow mealiemeal	48	45	41	36	49	45	41	35
Maize germ meal	10	10	10	10	10	10	10	10
Wheaten bran	5	5	5	5	5	5	5	5
Ground oats	10	10	10	10	10	10	10	10
Lucerne meal	10	10	10	10	10	10	10	10
White fish meal	14	9	5	—	16	10	6	—
Baked soybean meal	—	8	16	26	—	10	18	30
Bone meal	4½	5	5½	6	4½	5	5½	6
Oyster shell powder	1	1¼	1¼	1¼	1	1	1	1¼
Fine salt	—	½	¾	1	—	½	¾	1
Brewers' yeast	3	3	3	3	green feed	—	—	—
Manganese (grammes)	6	6	6	6	6	6	6	6

TABLE III.—*Vitamin Content of Rations. (Equal parts of mash and whole grain.) (Yellow Maize.)*

Vitamins, 1941.	Groups. 1.	2.	3.	4.	5.	6.	7.	8.
Riboflavin	212	161	156	172	202	193	193	193
Pantothenic acid	997	1,036	1,037	982	1,037	1,039	1,039	1,041
Choline	66	77	82	85	87	94	94	88
Nicotinic acid	5·3	5·3	5·2	4·9	5·0	4·9	4·9	5·0
1942.								
Riboflavin	250	231	224	208	209	190	183	165
Pantothenic acid	925	882	910	917	796	812	839	856
Choline	82	81	84	86	85	86	90	92
Nicotinic acid	3·8	3·7	3·7	3·5	3·4	3·3	3·3	3·2

NOTE.—(1) Riboflavin and pantothenic acid are indicated as gamma per 100 grammes of feed.

(2) Choline and nicotinic acid are indicated as milligrammes per 100 grammes of feed.

TABLE IV.—*Egg Production per Hen from 1 March to 31 August, and Percentage Mortality.*

	Groups.							
	1.	2.	3.	4.	5.	6.	7.	8.
1941.								
Egg per hen	83·5	71·3	58·3	67·4	48·1	34·8	48·4	75·6
Egg weight in grammes	56·6	54·3	54·5	55·3	54·5	56·2	54·0	53·3
Percentage mortality	12·5	0·0	4·2	15·0	5·0	5·3	0·0	10·5
1942.								
Egg per hen	64·1	42·8	47·3	22·6	54·0	51·1	66·4	49·4
Egg weight in grammes	53·7	55·3	54·8	52·4	52·1	55·1	55·1	53·4
Percentage mortality	8·7	33·3	38·1	56·2	21·4	37·5	22·2	19·0

NOTE.—A two-ounce egg is equal to 56·7 grammes.

According to statistical analysis, significant differences in egg production were obtained between certain groups of hens in 1941, as well as between groups in 1942. The experimental groups of 1941 cannot, of course, be compared directly with those of 1942. The reasons are: (*a*) that the pullets of the two years were not bred from the same parents; (*b*) that the rations did not contain the same sources of protein, and (*c*) that environmental factors in 1941 were not the same as in 1942.

Wheaten Bran.

In 1942 a high percentage of hens succumbed to various forms of cancer, but this disease did not occur during the 1941 experiments.

Results of the experiments indicate that wheaten bran is an important nutrient for the promotion of high egg production and the health of the hens. So far as is known, wheaten bran can be replaced only by brewers' yeast, but in view of the scarcity and present high price of the latter product, there is no hope of feeding this constituent in laying rations.

According to calculations, the omission of wheaten by-products results in a definite difference in the choline and nicotinic acid content of rations. Two typical rations are given in the following table:

	Rations.	
	A: lb.	B: lb.
Yellow mealiemeal	20	55
Wheaten bran	30	—
Pollard	20	—
Ground oats or barley	10	10
Lucerne meal	5	10
Meat meal	16	—
Groundnut meal	8	—
Oystershell	3½	3
Bone meal	—	2
Fine salt	1	—
Fish meal	—	20

If equal parts of mash and whole grain (yellow maize) are fed, ration A will provide 68 milligrammes of choline and 6·8 milligrammes of nicotinic acid per 100 grammes of feed, while ration B

will provide 94 milligrammes of choline and 3·2 milligrammes of nicotinic acid per 100 grammes of feed.

There is no doubt that ration A is much more effective for the promotion of high egg production than ration B. Of course, this difference cannot be ascribed only to the choline and nicotinic acid content of the rations, because the quality protein in wheaten by-products and other vitamins of the B complex also play an important rôle.

Owing to unavoidable circumstances, poultry farmers were compelled to feed ration B instead of ration A. Although egg production was adversely affected by ration B and other similar rations, much was, nevertheless, learnt by using substances which previously were practically unknown as poultry feed. It is possible that ration A is too low in choline and unnecessarily high in nicotinic acid. This is the case where a high percentage of wheaten bran is fed together with meat meal and bonemeal. Ration B, on the other hand, is probably too low in nicotinic acid. Provisionally it can be accepted that a laying ration should contain from 70 to 90 milligrammes of choline and from 5 to 7 milligrammes of nicotinic acid per 100 grammes of feed. In this connection it may not be out of place to refer to the experiment of Heuser (1943). The calculated choline and nicotinic acid content of Heuser's rations, as well as the egg production per hen are given in the following table:—

	RATION		
	Wheat.	Maize.	Wheat and Maize.
Choline	58·0	72·0	65·0
Nicotinic acid	9·1	2·6	7·3
Eggs per hen per year	186·0	154·3	207·4

Heuser found that a laying ration consisting mainly of a mixture of maize and wheat gave better results than rations in which the grains and by-products were fed separately.

A considerable amount of research work will still have to be carried out in order to determine whether choline-rich feeds have any influence on the health and production of birds, especially when the rations contain high percentages of minerals and protein. Choline has a fairly strong alkaline reaction, and Farner (1943) pointed out that a reduction in stomach acid concentration takes place when bonemeal and calcium carbonate are fed together with high percentages of fish meal, meat meal and soybean meal in rations.

N.B.—The writer wishes to express his thanks to Dr. J. H. Kellermann, Professor in Agricultural Chemistry, for valuable assistance in the compilation of this article.

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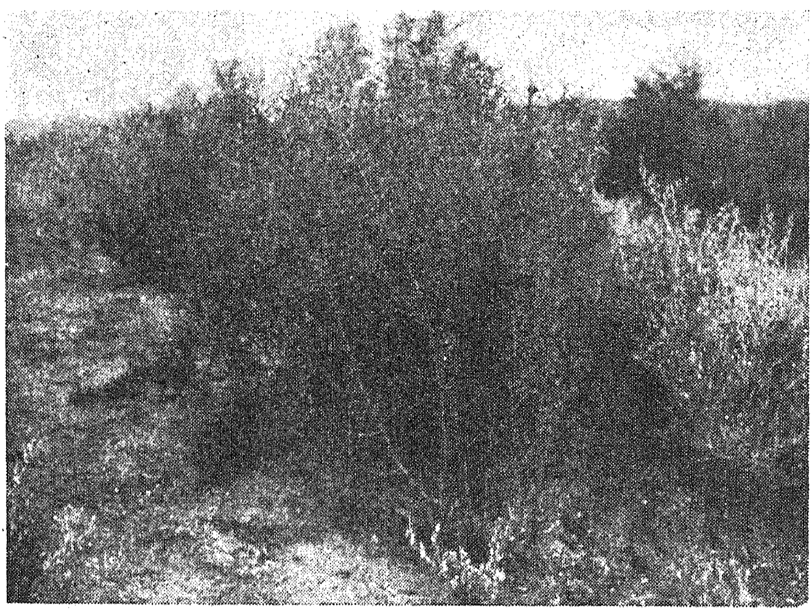
 [Continued on page 339.

The Eradication of Camel Thorn.

P. G. C. Brett, Botanic Station, Grahamstown.

THE camel thorn (*Alhagi camelorum* Fisch.), also known as Caspian Manna is found for about a score of miles along the banks of the Olifants River, where it is more and more becoming a serious danger to the farms along that stream. Unfortunately cultural methods are of no avail once the camel thorn has established



Alhagi camelorum, Oudtshoorn, May 1937.

itself. Investigations were therefore undertaken to establish chemical methods of eradication. The results of these investigations are being given in this article.

Eradication Experiments.

A new method of eradication consisting in dipping the tops of bushes into receptacles containing a solution poisonous to the plants was tried with promising results.

Several chemicals were tried out, and a 1·5 per cent. arsenic pentoxide and a 5 per cent. potassium-dichromate solution were finally selected as proving to be the most effective. A plot 25 by 50 feet, with rather scattered bushes, was treated with potassium dichromate and a plct 15 by 25 feet with a denser growth was treated with arsenic pentoxide. The tops of the bushes were dipped in jars distributed at intervals within the plots. Two days later the arsenic-pentoxide treatment showed by far the greater promise and further investigation was concentrated on this chemical; the unaffected plants were dipped and the plot extended frcm 15 to 35 feet, all bushes in the extended portion being treated.

Six weeks after these experiments had been carried out, all surface growth (including that of the untreated bushes) was dead.

The majority of the underground runners of plants treated with potassium dichromate were not yet completely killed, but a ring of reddish discoloration was present between the bark and the wood, and the damage was so extensive that it seemed certain that it would eventually prove fatal. Indeed, some of the runners were already dead; one, followed to a depth of four feet, was completely dried out for the whole of this distance.

In the arsenic-pentoxide plot two rhizomes, running parallel with the surface of the ground at a depth of about three feet were followed for a distance of four yards. They were completely dead and for the most part already dried out. Two vertical roots were dug up; one was killed to a depth of eleven feet, the other was dead for the ten feet it was followed before being lost.

A little more than six months after the treatment had been carried out, another visit was paid to Oudtshoorn, when the untreated healthy plants were found to be two feet or more in height. The general appearance of the plot treated with potassium dichromate indicated that previously there had been no regrowth of those plants which had had their foliage killed by this treatment. It was noticeably less infested with camel thorn than the surrounding areas, only about twenty living bushes being present, and, almost certainly, at least some of these had not been connected to any treated plant.

Confirmation was obtained of the very good results thought to have been given by arsenic pentoxide. Many plants outside the plot had been killed, and on the whole of the treated area only four bushes were growing. It is to be presumed that these arose from runners which had not reached the surface at the time of treatment.

Conclusions: Though this method may not prove quite as simple and effective under all conditions and circumstances, it appears to offer a suitable means for the eradication of camel thorn. More work will be necessitated if the underground runners have been much cut up by ploughing or previous attempts at eradication. Plants growing in the damp soil along river beds may show a reduction in the readiness with which the solution is normally absorbed from the jars. Nevertheless, in spite of minor disadvantages, this method appears capable of checking the spread of camel thorn and may indeed make possible its complete eradication, if carried out before the position has assumed too serious proportions.

Method of Eradication.

Of the two chemicals suggested for the eradication of this weed, arsenic pentoxide is not only by far the more effective, but is also considerably cheaper.

Containers: Jars such as those in which honey is sold or ordinary jam tins can be used as containers for the solution in which the tops of the bushes are dipped. If tins are used, it is necessary to squeeze the rims together somewhat so that the branches, once inserted, will remain fixed.

Solutions.—(*a*) *Potassium dichromate*: To make up a solution for treatment, dissolve 5 lb. of powdered potassium dichromate in every 10 gallons of water.

(*b*) *Arsenic pentoxide*: The extremely poisonous nature of this substance must never be overlooked. One and a half pounds of arsenic pentoxide dissolved in every 10 gallons of water gives the right solution for treatment.

Procedure: The dipping method has the advantage that it is not necessary to treat each individual bush, and the jars or tins can simply be scattered amongst the plants. Shoots are inserted in each container—it is convenient to bend the tops back upon themselves before insertion. The containers are then filled with the poisonous solution and left in position for 36 to 48 hours. In practice it is convenient to allow the jars or tins to remain in position for the whole of the day following treatment and to move them to fresh bushes on the third day. By that time it will be possible to see which of the bushes are dying, and if desired those bushes which escaped can be treated before work is started on a fresh patch.

After a little practice, two men working together can put out quite a few hundred jars in a day.

The best time for treatmnt of the camel thorn would appear to be about October-November, when the bushes have attained maturity but have not begun to lose their leafy appearance.

It appears that even when the treatment is correctly carried out there is a slight amount of regrowth, but the few plants that do survive can easily be killed the following season by the same method.

Further investigations are being carried out to improve the potassium-dichromate method.

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Nursery Quarantines.

The following nursery quarantines were in force on 1 April 1944:—

(1) Beaulieu Nurseries, Forestdale Siding, P.B. Grahamstown, C.P., on citrus (all) for red scale.

(2) Alexander's Nurseries, Lawrance Street, Grahamstown, C.P., on citrus (all) for red scale.

Choline and Nicotinic Acid in Poultry Rations:—

[*Continued from page* 336.

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The Farm Home.

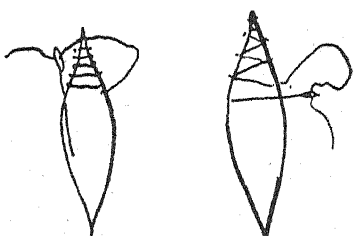
(A Section devoted mainly to the interests of Farm Women.)

Making Soft Toys.

Miss S. J. A. van Schalkwyk, Home Economics Officer, Department of Agriculture and Forestry.

VERY attractive toys can be made with small pieces of material, a few tools and a little trouble. Children love playing with such toys since they are light, and soft to handle, and, therefore particularly suitable for very small children since they can in no way hurt themselves when playing with them.

Material.—Cotton, rayon, silk and woollen material can be used and the material may be plain-coloured, checked, floral, spotted or striped. For animals like ducks, birds, cats, dogs, etc., towelling or a material with a pile is very suitable. It is not essential, however, that such materials should be used.



Ladder-stitch. Cross-stitch.

FIG. 1.

For stuffing soft toys various materials can be used. Kapok is to be preferred, however, since it is light, soft and fine, and allows of uniform stuffing. For greater economy, it can be mixed with cotton wool. Kapok should always be well teased before being used for stuffing purposes. Well scoured and teased sheep's wool or snippets of material are also suitable for stuffing toys. For firmer articles woodwool can be used. Such toys will be more suitable for the older child. Always use a strong stick for stuffing and first stuff the narrow extremities like the legs and arms, then the head, and finally the body. The opening in the body is sewn up with a ladder or cross stitch, as shown in Fig. I.

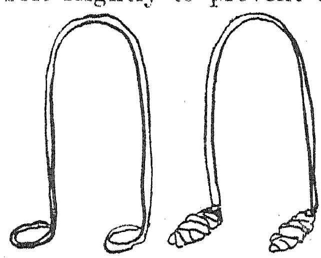
Strong thread must be used and a curved needle will facilitate the work.

Always try to make the animals look as natural as possible. Use a live animal or a picture as a model. The shape can be improved by stitching right through the body of the toy, with a strong thread.

Animals intended to stand should have firm legs. Binding wire can be used to make the legs rigid. Cut off a piece sufficiently long for a pair of legs and bend it, as shown in the *illustration*. Also bend the ends. Wrap cottonwool, wool or material around the ends and sew it on firmly. Insert the wire into the fore- and hindlegs, and stuff round the wire so that it will remain in position.

Movable limbs, such as the arms and legs of a doll or the wings of a penguin, are attached as follows: Use a pair of round, wooden

washers and a nut and bolt (about 1 in. in length), for each arm, leg or wing. Stuff the arm tightly and shape it well, put a bolt through a wooden washer and place the washer on top of the stuffing inside the arm. Now draw the arm tightly around the bolt but allow the latter to protrude. Push the bolt through the point fixed for the arm, insert it through another wooden washer, and screw down the nut. Rivet the thread-end of the bolt slightly to prevent the nut from working



(a). (b).

FIG. 2.

loose. Attach the other arm and legs in a like manner and then stuff the body. The penguin's wings are attached in the same way.

The faces of animals can be worked in wool, silk or embroidery cotton. Eyes are obtainable in various sizes from taxidermists at about 1s. a pair. They are sold attached to a piece of wire which must be cut off at a distance of about ½ inch from the eye. Then bend the wire to form a small loop. Attach a double strand of strong thread to the loop with the aid of a long needle. Cut slits into the animal's head, where the eyes should come and sew the eyes into position by passing the needle backwards and forwards through the head; try to make the stitches show as little as possible.

It is important that the patterns for toys should be cut out as accurately as possible. A good idea is to cut the patterns and paste them on soft cardboard. This will facilitate the tracing of the pattern on the material and the patterns will also last longer than paper patterns.

Duck: 10 inches high.

Material required: About ⅓ yard of towelling or other suitable material. A small piece of material of contrasting colour for the bonnet and saje; 1½ yards tape; cardboard for the legs, brown embroidery wool, kapok or other stuffing material. Cut out and sew the two body parts together. Leave an opening underneath between the marks. Turn inside out, stuff and sew up the lower opening. Sew up the two wings and the beak, leave an opening and turn inside out. Stuff loosely and sew on to the body at the marked spot. Sew up the legs, turn inside out and slip in a piece of cardboard and stuff loosely above the cardboard. Stitch up the openings and sew the legs on to the body on either side of the seam where the body was closed up.

Use brown wool to embroider the eyes.

Cape.—Hem all the edges, except along the top, of the two pieces marked "F".* Sew a piece of tape or ribbon, 27 inches long, on to the upper edges so that the two pieces meet in the middle of the tape. Tie the cape around the duck's neck with a bow in front.

Bonnet.—Stitch the other two pieces marked "F" together. Leave them open at the top. Turn inside out and sew the upper

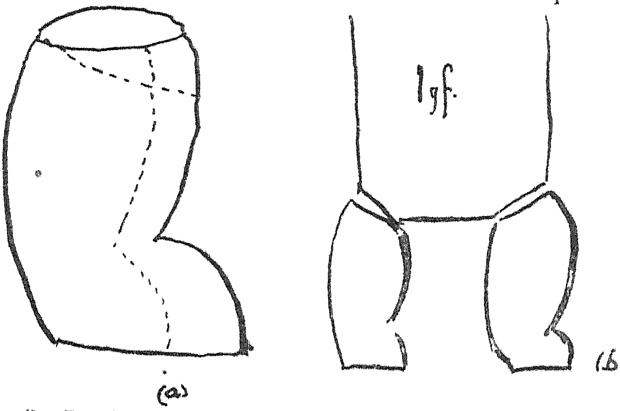
* The figures are not given but printed patterns are obtainable from the Division at 1s. per sheet.

side on to the middle of a piece of tape, 18 inches in length. Tie the bonnet on to the head and make a bow underneath.

Doll: 22 inches high.

Material required.—About $\frac{3}{4}$ yard cream-coloured or pink material. A flour or salt bag can also be used. One-eighth yard black black or khaki-coloured silk material for the wig (this is not absolutely necessary); 4 pairs of wooden washers and 4 nuts and bolts (1 inch). Brown or black, and red embroidery silk. Kapok, sheep's wool or snippets of material for stuffing. Cut out all the pieces and sew the two body parts together, leaving an opening at the neck. Turn inside out and stuff. Sew up the opening. Stitch the arms and legs, leaving them open at the top, turn inside out and stuff.

The head is also stitched and turned inside out. Embroider the face and stuff the head. Stitch up the neck at the opening and sew the head to the body where the latter has been closed up.



Stuffed leg. FIG. 3.

The arms and legs can be attached by means of wooden washers and bolts, as described above, or they may simply be sewn up and worked on to the body. In the latter case the legs must be folded diagonally and sewn to the body after they have been stuffed.

If the wig is omitted, a bonnet should be made for the doll. Also make a dress or knitted suit.

Penguin: 8¾ inches high.

Material.—$\frac{1}{4}$ Yard white material with pile; $\frac{3}{8}$ yard black material with pile. (This will be sufficient for three penguins. These quantities are necessary for the depth of the pattern). Kapok or other stuffing material; a pair of small black and white glass eyes; 2 pairs of wooden washers $\frac{3}{4}$ inch in diameter for the wings; and 1 pair of $1\frac{1}{4}$ inch diameter for the head; 6 inch square orange felt for the legs and beak, 11 inches soft wire for legs and feet. Carefully cut out all the parts. First stitch the back and front pieces " A " and " B " together.

The piece marked " E ", which forms the rear part of the legs, is then sewn on to the bottom of the front part so that the points marked A, B, F, G, and H and I coincide on the various pieces. Sew up from A to I; H to G and F to B. Leave an opening in between for the legs and feet.

Place J on J on the rear part and stitch up from A to J and from J to B to form the tail. Stitch the head pieces together, turn inside out and stuff. Attach the head to the body by means of a pair

of wooden washers ($1\frac{1}{4}$ inch in diameter), a nut and bolt. (See description above.)

Make the wings, leaving an opening, and stuff lightly. Sew up the openings. Attach the wings to the body by means of wooden washers, bolts and nuts, with the white side against the body.

Make the beak and legs of felt and strengthen the legs by inserting a bent wire. Stuff the legs and feet and sew up. Attach to body by pushing the top of the legs through openings FG and HI in lower part of body; and stitch tightly so that only the legs protrude. Bend the legs so that the bird will stand upright and stuff the body. Stitch up the opening. Make the beak, stuff it and sew on to the head with E coinciding with E. Then sew on the eyes to complete the penguin. *N.B.*—The colours to be used for the various parts are indicated on the pattern.

Giraffe: 10 inches high.

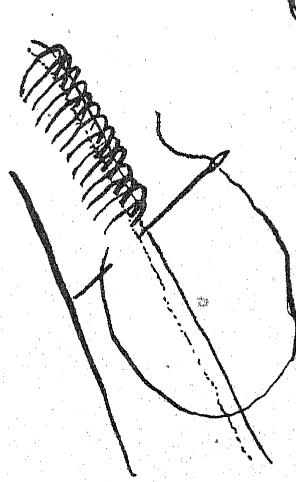
Material.—$\frac{1}{4}$ Yard material; 32 inches soft wire; black embroidery silk or wool; string; kapok or other stuffing material.

Carefully cut out all the pieces and place the lower parts of the body on the body parts so that the corresponding letters coincide. Stitch up and leave the legs open at the bottom in order to sew on the soles later on.

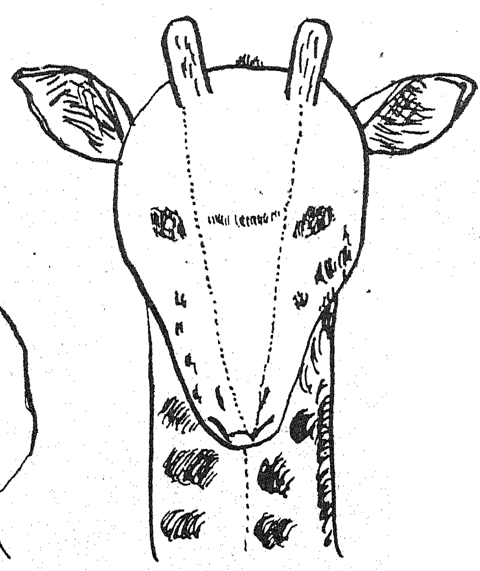
Stitch the back gusset on to one of the body parts, with F falling on F and B on B. Also stitch on the head gusset with D falling on D and E on E. Then sew the rest of the body piece on to this, starting at D and proceeding over the head, along the neck and over the back to B. Then stitch up in front from D to A.

Stitch the pieces for the lower part of the body together leaving an opening for stuffing. Stitch on the soles and turn inside out. Cut the wire in half, bend in the middle, so that the arches are 6 inches high and $1\frac{1}{2}$ inches apart. Make a little loop at each end for the foot, wrap kapok or a piece of material round it and insert into the front and hind legs. Stuff further and stitch up.

Use single pieces of felt for the ears. Pleat the straight side and sew on to the head in the positions indicated in the sketch. Insert two reeds for the horns.



(a).



(b).

FIG. 4.

Embroider the eyes, nose and mouth with black cotton and the mane with black wool as indicated in Fig. 4.

Use a piece of string for the tail and attach it just above the lowest point of the back gusset.

Duckling: 6½ inches high.

Material.—About ¼ yard material, pieces of felt for the beak and legs; 48 inches of soft wire for the legs and feet; black embroidery silk or cotton; and kapok or other stuffing material.

Carefully cut out all the pieces. Stitch the piece for the lower part of the body on to one of the body parts from A to B. Now stitch the two body parts together from A over the head and back to B. Then sew the lower body part on to the second body part and leave an opening. Stuff well and stitch up.

Stitch up the wings, turn inside out and stuff lightly. Stitch up the openings and sew the wings on to body along the dotted line.

Sew up the beak and legs with a back stitch on the right hand side. Cut the wire into 6 pieces, each 8 inches in length, and bend them all double. Insert the double ends of three pieces of wire into each leg, between the rows of stitching. Bend up the other ends, stuff the legs and tie kapok or wool around the protruding ends of the wire. Using a pair of scissors, make a cut on either side of the lower part of the body and insert the upper parts of the legs. Stitch on tightly. Turn up the feet so that the duck will stand. Pass a few stitches through the body from one side to the other. The felt beak is slipped over the duck's beak and sewed on.

Embroider the eyes with embroidery silk or cotton.

A sheet of printed patterns of the above animals and doll is obtainable from the Division of Animal and Crop Production, Department of Agriculture and Forestry, Prudential House, Pretoria, at 1s. per sheet.

Cultivation and the Soil Mulch :—

[*Continued from page 298.*

crops of weed seedlings by surface cultivation prior to planting, followed by two or three thorough cleanings within the first six weeks of the growth of the crop.

A disc harrow followed by a drag or spike-tooth harrow is the most effective implement for surface cultivation when weeds are small. For larger weeds a heavy tine cultivator fitted with sweeps is more satisfactory. Provided operations with these implements are carried out at the right time a second ploughing of land which has previously been winter-ploughed is seldom necessary. By confining the amount of ploughing to the absolute minimum required for the proper working of the soil the farmer can not only reduce costs of production, but also conserve soil humus.

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Crops and Markets

A Statistical and Economic Review of
South African Agriculture

by

The Division of Economics and Markets

Vol. 23 MAY, 1944 No. 261

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* Price Review for March, 1944.

SLAUGHTER CATTLE.—In general good supplies of slaughter cattle arrived on the markets during March. As a result of the fact that consignments included a large percentage of compounds, prices in general were low, e.g., National Mark primes were 71s. 5d. for March as compared with 73s. 1d. for February; good mediums 60s. 4d. as against 64s. 2d. and compounds 46s. 5d. as against 48s. 5d. per 100 lb. estimated dressed weight.

On the Durban market a considerable increase in supplies was experienced. As a result of a keen demand during the month, prices remained constant in comparison with those of the previous month. National Mark primes were sold at 86s. per 100 lb. dressed weight and good mediums and compounds at 49s. and 41s. 10d. respectively.

Slaughter Sheep.—Prices of slaughter sheep in general remained constant throughout the month. Moderate supplies were experienced on the Johannesburg market .

During the last part of the month the supply increased considerably as a result of the sudden price increase, with the result that prices declined, but towards the end of the month the market closed somewhat more firmly.

Prices for prime merinos averaged 12·8d. per lb. estimated dressed weight, which only shows a very slight increase in comparison with the previous month.

Good supplies, consisting mainly of second grade and lamb, as also primes, were present on the Durban market. The demand was keen throughout and maximum prices were maintained at the same level as that of the previous month, e.g., 11¼d. per lb. estimated dressed weight.

Pigs.—Fairly large supplies of pigs reached the Johannesburg market. The demand for baconers was good throughout and prices consequently improved from 6·8d. per lb. live-weight for February to 7·0d. for March. Porkers enjoyed a good demand for the greater part of the month and sold at firm prices. Towards the end of the month the demand for porkers weakened and prices declined from

* Al prices mentioned are average.

7·2d. per lb. live-weight for the previous month to 6·9d. per lb. for March.

Good supplies of baconers and porkers arrived on the Durban market. The demand for both classes remained firm in general, and prices consequently improved. Baconers, particularly, experienced a keen demand and prices advanced considerably, e.g., from 7·9d. per lb. live-weight for February to 9·2d. per lb. for March. Prices for porkers, compared with those of the previous month, increased from 9·9d. to 10·9d. per lb. live-weight.

Grain and Hay.—Lucerne was in abundance on all markets. The Johannesburg market, however, was glutted by large quantities of inferior quality Vaal-Hartz lucerne and sales were poor. Railings from the Cape, however, sold well. Teff was well supplied but prices were low.

Vegetables.—Compared with the previous month, somewhat bigger quantities of vegetables arrived on the Johannesburg market. Green beans from the lowveld were supplied in larger quantities and prices declined. The average price per bag dropped from 4s. 4d. for February to 2s. 9d. for March. On the Cape Town market on the contrary supplies of all kinds of vegetables were small and prices were maintained on a high level.

Potatoes.—During the first half of the month, fair supplies of potatoes arrived on the Cape Town, Johannesburg and Durban markets and good prices were maintained. During the second half and particularly during the last week supplies decreased. The demand was good throughout and good prices were obtained.

Fruit.—Extraordinary large supplies of apples reached the Johannesburg market, with the result that prices dropped somewhat. On the Cape Town market apples were also plentiful, but good prices were, however, realized. Grape supplies increased in general. On the Johannesburg market the demand also increased and prices advanced, e.g., lugs were sold at 4s. 7d. in comparison with 3s. 11d. during the previous month.

The supplies of other deciduous fruits were smaller throughout. On the Johannesburg market a good demand was experienced for pines and although consignments doubled, good prices were realized.

Tomatoes.—An acute shortage of tomatoes was experienced on the Johannesburg market during the month. The prices for 1st grade National Mark, e.g., advanced from 4s. 2d. to 8s. 1d. per tray. On the Cape Town and Durban markets a considerable shortage was experienced at the end of the month although supply conditions were better at the beginning of the month.

Eggs and Poultry.—Eggs were in general scarce and expensive. Good supplies of poultry arrived on practically all markets. The demand was firm throughout and prices good.

Index of Prices of Field Crops and Pastoral Products.

THIS index, as shown elsewhere, showed a slight decrease in comparison with the previous month. The only important changes occurred in the case of:—

1. *Hay*, which decreased from 134 during February to 124 during March, as the main market was glutted and also because of poorer quality.

2. "*Other Field Crop Products*", i.e., potatoes, sweet-potatoes, onions and dry beans which decreased from 188 during February to 179 during March, as a result of a sharp decline in the prices of potatoes and sweet-potatoes.

3. "*Poultry and Poultry Products*", which increased from 135 during February to 240 during March, as a result of a further increase in the price of eggs.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39	92	107	96	89	79	102	106	92	98
1939-40	86	107	77	95	115	105	106	89	103
1940-41	109	113	106	156	102	108	110	104	108
1941-42	121	134	143	203	102	131	134	145	123
1942-43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158
February	168	183	134	188	122	144	176	235	158
March	167	183	124	179	122	144	174	240	157

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet-potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Oranges and Pawpaws.

SEASON (1st April to 31st March).	ORANGES (Pocket).							PAWPAWS (Standard box).	
	Johannesburg.			Cape Town.		Durban.		Johannesburg.	
	Navels. N.M.	Other. Navels.	Other. Valencias.	Navels.	Valencias.	Navels.	Valencias.	N.M.	Other.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 10	1 6	1 5	2 0	2 1	—	—	2 0	1 7
1940-41	1 9	1 7	1 6	1 11	1 10	2 4	2 1	2 2	1 9
1941-42	1 9	1 8	2 6	1 10	2 5	1 11	2 1	2 1	1 10
1942-43	2 4	2 6	3 1	1 11	3 9	2 8	2 11	2 7	2 1
1943—									
January	2 0	3 8	4 0	—	4 10	2 4	3 9	3 9	2 0
February	7 1	5 8	5 3	—	7 6	—	4 9	4 11	3 6
March	5 11	5 4	4 1	6 6	8 6	3 3	5 8	5 2	3 9
April	3 4	2 11	2 10	5 3	4 9	3 3	4 0	4 4	3 3
May	2 6	2 4	2 0	2 8	2 0	2 4	—	4 1	2 11
June	2 6	2 4	1 9	2 6	—	2 7	—	3 9	2 9
July	—	2 5	1 9	2 5	—	2 6	2 5	3 2	2 4
August	—	2 6	1 11	—	—	2 6	2 5	3 4	2 1
	Gr. I.	Gr. II.	Gr. II.						
September	3 1	2 10	2 2	—	—	2 7	2 6	3 3	2 4
October	2 3	2 4	2 3	—	—	—	2 5	3 0	2 5
November	—	—	2 2	—	—	—	2 6	2 8	1 11
December	—	—	3 0	—	—	2 11	3 3	3 3	2 3
January	4 6	4 2	3 8	—	—	4 0	3 10	3 1	2 1
February	5 0	—	4 1	—	—	1 6	3 6	5 1	4 11
March	4 9	4 7	3 11	—	—	—	4 8	7 3	6 3

Average Prices of Apples, Pears and Grapes on Municipal Markets.

SEASON (1st July to 30th June).	APPLES (Bushel box).						PEARS (Bushel box).		GRAPES (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johannesburg.
	O'henimuri.	White Winter Pearmain.	Wemmershoek.	O'henimuri.	White Winter Pearmain.	Wemmershoek.	N.M. No. 1.	Other.	All kinds.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41	8 4	7 1	6 4	8 11	10 8	5 0	8 11	6 3	1 8
1942–43	8 11	7 11	7 3	9 1	10 9	6 9	7 3	8 0	1 11
1942–43	14 9	11 6	9 1	10 8	12 11	6 11	—	10 8	1 10
1943—									
January	—	17 5	—	11 5	—	—	—	9 3	2 3
February	10 1	11 0	14 4	8 11	9 0	4 11	—	9 10	1 5
March	8 5	10 1	8 10	9 2	11 8	5 9	—	10 0	2 0
April	13 10	10 6	11 7	10 4	12 2	6 11	—	12 8	2 2
May	16 8	11 11	12 5	12 0	13 0	8 0	—	14 8	2 9
June	18 3	17 1	12 8	14 1	16 5	13 1	—	—	3 4
July	17 3	19 7	—	12 6	17 2	14 0	—	—	—
August	19 5	18 10	13 3	13 10	17 9	—	—	—	8 5
September	19 5	21 10	11 4	12 6	19 1	7 7	—	—	15 0
October	25 3	26 0	—	12 1	15 0	—	—	—	—
November	27 3	29 7	—	11 7	12 8	—	—	—	—
December	29 9	30 0	—	16 7	18 5	—	—	—	6 2
1944—									
January	15 1	—	18 0	16 10	—	—	—	20 7	3 7
February	12 4	—	13 2	11 0	—	6 9	—	14 2	3 5
March	8 7	8 5	8 1	9 8	12 6	5 7	—	13 11	2 11

Average Prices of Slaughter Cattle.

SEASON (1st June to 31st May).	BEEF per 100 lb.									
	Johannesburg. (a)				Cape Town. (a)			Durban. (b)		
	Prime. No. 1.	Good Medium. No. 2.	Medium. No. 3.	Compound. No. 4.	Prime. No. 1.	Good Medium. No. 2.	Medium. No. 3.	N.M. Good. No. 1.	Good Medium. No. 2.	Medium No. 3.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	39 0	36 3	33 9	31 7	36 8	34 3	31 11	—	33 0	—
1939–40	38 5	35 5	33 0	30 10	37 11	35 4	32 0	—	33 7	—
1940–41	41 4	37 11	34 11	32 4	41 1	38 0	34 9	—	34 0	31 3
1941–42	52 1	47 4	42 6	38 4	52 3	48 1	43 1	45 9	—	40 3
1942–43	63 2	57 9	51 5	46 1	60 4	56 3	50 6	55 11	—	45 6
1943—										
January	62 10	57 2	52 1	47 10	63 11	59 3	53 9	55 9	51 0	45 6
February	60 11	55 8	49 11	44 5	62 8	58 3	51 9	55 1	50 4	43 11
March	59 2	54 4	48 1	43 4	57 8	53 8	47 8	52 1	46 8	41 0
April	60 8	55 8	48 4	43 4	59 7	55 0	49 5	52 5	47 2	42 1
May	59 11	55 3	48 11	43 9	61 3	56 11	51 0	52 6	47 6	42 6
June	58 2	54 9	46 10	46 2	58 11	54 8	49 2	52 6	47 6	42 6
July	66 10	63 11	60 3	55 0	66 5	60 2	53 5	57 10	50 5	45 6
August	70 8	65 3	60 6	56 0	75 4	67 9	58 10	63 0	55 0	49 0
September	76 11	72 10	69 0	65 8	76 4	68 7	60 5	63 0	55 0	49 0
October	81 11	77 10	70 8	65 8	78 11	72 0	64 11	63 0	55 0	49 0
November	81 0	75 5	69 5	63 10	87 10	78 11	69 3	63 0	55 0	49 0
December	73 8	69 2	62 10	57 10	89 2	82 2	72 2	63 0	55 0	49 0
1944—										
January	69 11	66 2	60 11	55 8	82 10	77 8	68 0	63 0	55 0	49 0
February	68 6	64 2	56 2	48 5	75 8	70 10	62 6	63 0	55 0	49 0
March	66 3	60 4	53 2	46 5	70 10	65 2	59 2	63 0	55 0	49 0

(a) Estimated dressed weight of cattle as sold on the hoof.
(b) Dressed weight of carcase sold on the hook. According to new meat regulations as from October, 1942; No. 1 corresponds approximately to N.M. good, No. 2 to good medium, and No. 3 to medium.

Average Prices of Sheep and Lambs.

SEASON (1st June to 31st May.)	MUTTON (per lb.). Johannesburg. (a) Merino Hamels. Prime.	Johannesburg. (a) Merino Hamels. Medium.	Johannesburg. (a) Cross-breds. Prime.	Cape Town. (a) Merino. Prime.	Cape Town. (a) Persians and Cross-breds. Prime.	Durban. (b) Prime. No. 1.	Durban. (b) Medium. No. 2.	LAMB (Prime) (per lb.). Johannesburg. (a)	Cape Town. (a)	Durban. (b) No. 1.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·3	5·5	5·8	5·8	5·9	6·1	5·3	6·7	6·4	8·3
1939–40	6·5	6·0	5·9	5·9	5·9	6·3	5·5	6·8	6·6	8·0
1940–41	6·7	6·1	6·2	6·1	6·3	6·5	5·8	7·0	6·6	8·0
1941–42	8·3	7·4	7·5	7·7	7·6	7·7	6·9	8·6	8·1	8·8
1942–43	11·5	9·8	9·8	10·7	10·5	10·5	9·6	11·4	10·8	11·3
1943—										
January	11·2	9·4	9·5	10·8	10·4	10·7	9·9	11·2	10·8	11·1
February	10·5	8·6	8·2	10·1	10·1	10·5	9·4	10·4	10·2	11·0
March	11·5	9·8	9·0	11·7	11·1	10·2	9·1	11·5	11·3	10·9
April	12·0	10·2	9·5	12·4	11·6	10·3	9·5	12·0	11·8	11·0
May	12·0	10·3	9·6	11·1	11·1	10·3	9·5	11·8	11·2	11·0
June	11·4	10·2	10·4	10·8	11·0	10·3	9·5	11·8	11·3	11·0
July	11·4	10·3	10·3	11·4	11·2	10·5	9·8	11·7	11·2	11·1
August	11·8	10·2	10·8	12·4	12·2	10·8	10·0	11·9	12·6	11·3
September	12·8	10·9	12·0	12·0	12·0	10·8	10·0	13·1	12·2	11·3
October	11·5	9·6	10·1	11·3	11·2	10·8	10·0	12·1	11·5	11·3
November	11·9	10·1	10·6	10·9	11·1	10·8	10·0	12·6	11·4	11·3
December	12·9	11·4	11·5	11·6	12·0	10·7	10·0	12·9	12·1	11·3
1944—										
January	12·4	10·4	10·9	12·1	12·0	10·8	10·0	12·5	11·8	11·3
February	12·3	10·3	9·6	11·6	11·7	10·8	10·0	12·6	11·7	11·3
March	13·0	10·9	11·7	12·4	12·4	10·8	10·0	12·2	12·5	11·3

(a) Estimated dressed weight as sold on the hoof.
(b) Dressed weight on the hook.

Average Prices of Pigs.

SEASON (1st June to 31st May).	Johannesburg. (a) Baconers. Prime.	Johannesburg. (a) Baconers. 2nd grade.	Johannesburg. (a) Porkers. Prime.	Johannesburg. (a) Porkers. 2nd grade.	Johannesburg. (a) Stores.	Durban. (b) Baconers. Prime.	Durban. (b) Baconers. 2nd grade.	Durban. (b) Porkers. Prime.	Durban. (b) Porkers. 2nd grade.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·2	5·7	5·3	4·9	5·0	6·7	6·2	7·6	6·6
1939–40	5·6	5·1	5·2	4·7	4·8	6·7	6·1	7·2	6·3
1940–41	5·4	4·5	4·5	3·8	4·0	6·8	6·3	7·1	6·3
1941–42	6·6	5·2	5·1	4·0	4·5	8·1	7·1	8·1	6·9
1942–43	8·6	7·5	7·2	6·0	6·9	10·3	9·0	10·6	9·1
1943—									
January	8·4	7·7	7·8	6·6	8·4	9·4	8·5	10·3	9·1
February	8·8	7·8	7·4	6·3	8·0	10·2	9·3	10·5	9·4
March	8·8	7·7	6·8	5·7	6·2	11·4	10·1	11·3	9·9
April	9·1	8·1	6·9	5·9	6·5	11·2	9·7	11·5	9·7
May	8·7	7·8	7·6	6·7	6·6	11·9	10·7	12·1	10·4
June	8·7	7·8	8·3	7·4	7·4	11·4	9·9	11·4	9·8
July	8·6	7·7	8·4	7·1	7·1	10·6	8·8	11·9	9·2
August	8·7	7·5	8·4	7·2	7·2	10·8	9·1	10·0	8·5
September	8·9	7·6	7·7	7·0	7·4	10·9	9·9	11·3	10·2
October	8·8	7·7	7·7	6·9	7·8	10·3	8·6	10·0	8·4
November	8·4	6·4	7·7	6·8	7·5	10·2	8·8	10·7	8·8
December	7·7	6·4	8·1	7·2	7·3	10·3	8·8	11·3	9·8
1944—									
January	7·3	6·0	7·6	6·3	6·5	8·7	7·3	10·9	9·1
February	7·2	6·1	7·7	6·6	6·9	8·5	7·2	10·8	8·9
March	7·6	6·4	7·4	6·5	6·3	9·9	8·5	11·7	10·1

(a) per lb. live weight.
(b) per lb on the hook.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season (1st July to 30th June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade I.		Natal.	O.F.S.	Transvaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939–40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940–41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941–42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942–43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 6	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	18 1	14 10	11 6

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

Season. (1st July to 30th June).	Onions (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johanburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939–40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940–41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941–42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942–43	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June	17 3	17 4	15 3	18 1	12 0	18 9	8 5	8 6	9 2
July	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
November	16 5	—	19 7	—	22 9	25 1	13 5	11 11	10 8
December	12 11	13 10	9 3	15 1	18 6	16 6	12 0	10 5	9 9
1944—									
January	11 3	10 9	8 8	12 3	9 6	11 7	14 1	9 4	11 10
February	12 7	14 0	7 10	11 7	12 9	13 9	15 8	10 10	11 6
March	14 4	14 10	11 1	15 0	13 5	15 1	12 11	8 6	10 10

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1st July to 30th June).	Cabages (Bag). (a)			Cauliflower (Bag). (a)			Tomatoes (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941–42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942–43	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2
February	7 5	7 8	22 2	6 8	—	—	4 7	1 9	2 9	2 3
March	13 4	10 6	25 7	10 4	8 11	15 6	6 8	3 3	2 5	2 5

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb. Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.).			Green Peas (Pockets 20 lb.).			Carrots (Bag). (a).		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940–41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941–42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942–43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	18 2
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	19 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 11	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11
December	2 1	0 6	2 5	3 8	1 5	5 10	8 6	7 0	7 7
1944—									
January	1 9	1 2	3 5	4 7	1 6	6 7	7 4	3 5	7 10
February	4 4	2 1	4 0	7 2	—	5 9	9 0	6 0	15 1
March	2 8	3 8	2 0	6 9	5 0	6 6	13 6	8 11	24 5

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb. Cape Town, 90 lb.: and Durban, 120 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1st July to 30th June).	Eggs.			Fowls (Live, each).			Turkeys (Live, each).		
	Johannesburg, New Laid. Per Dozen.	Durban, New Laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39..........	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40..........	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41..........	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42..........	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942-43..........	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January........	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February.......	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March..........	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April..........	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May............	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June...........	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July...........	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August.........	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September......	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October........	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November.......	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December.......	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 8
1944—									
January........	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11
February.......	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March..........	2 10	2 0	19 10	4 1	4 11	4 7	13 5	18 3	13 4

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.).			Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.).		Dry Beans (200 lb.). bags.		
	Johannesburg (a).		Cape Town 1st. grade.		F.o.r. Producers Stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cow Peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39..........	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 0	24 2
1939-40..........	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41..........	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42..........	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43..........	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January........	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February.......	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March..........	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April..........	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May............	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June...........	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July...........	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August.........	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September......	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October........	6 2	5 7	7 4	5 6	22 0	23 9	54 7	33 8	32 11
November.......	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December.......	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January........	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2
February.......	5 2	3 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March..........	4 11	3 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6

(a) Municipal Market.
(b) Seasonal year for Kaffircorn 1st June–31st May; Dry Beans 1st April–31st March; Lucerne and Teff 1st July–30th June.

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[*Photo on Cover by S.A.R. & H.*]

[**NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.**]

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions :—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.
Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmers' Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ...AFRICA

Vol. 19 JUNE 1944 No. 219

Editorial:

Compost.

An article on the preparation and use of compost appears elsewhere in this issue of *Farming in South Africa*. This article was drawn up by Dr. N. Viljoen of Potchefstroom from articles which have appeared in the course of the past few years. Compost has latterly been the subject of so many articles that regular readers may perhaps find a repetition of the same old story annoying. To such readers we wish to offer our apologies. In justification of our publication of the article we should like to point out, however, that the Department continues to receive numerous requests from farmers for literature on compost, especially in regard to the practical aspect of the matter. Unfortunately, reprints and bulletins are practically no longer available. Since compost occupies such an important position in successful farming, especially in view of the prevailing conditions of fertilizer scarcity and the difficulty of transporting kraal manure, the Department feels that it is almost impossible to give too much attention to the subject.

For those officers of the Department who are devoting their lives to the task of enlightening farmers on plant nutrition and soil improvement, it is most gratifying to find that the number of farmers who are beginning to realize that it is their duty to pay more attention to their soils and the crops to be grown on them, is increasing every day. It is hoped that the present increased demand for fertilizer, Karroo manure and other plantfoods and soil improvers is not merely the result of the prevailing high prices of products, and that later, when times are normal once again or even when times of depression set in, the agriculturist will continue to regard it as his duty to give his soil proper treatment and to maintain its fertility.

Generally speaking, it may be said that the object of applying artificial fertilizer is to produce larger crops. For the farmer who has to make a living from the soil this is, of course, a matter of cardinal importance, but he must at the same time not lose sight of the fact that the welfare of posterity is at stake. The man who is imbued with a love for the soil from which he has to wrest a living, will not think of immediate profits only. He will aim at maintaining and, if possible, even at improving the fertility of his soil. It is particularly this class of farmer who realizes the necessity for introducing large quantities of organic matter into cultivated soils from time to time. Under the climatic conditions prevailing in South Africa the remains of organic material present on the lands disintegrate or decompose within a comparatively short space of time, and since the good properties of an arable soil are largely dependent on its organic content, the agriculturist is compelled to restore such organic matter at short intervals.

There are various ways in which the organic material in arable soils can be supplemented. This can be done, for example, by ploughing in large quantities of manure, or by growing and incorporating in the soil a green manure crop, or by planting the soil to

[*Continued on page 358.*

The New Chief of a Division.

DR. R. A. DYER, who, in February 1944, succeeded Dr. E. Percy Phillips, as Chief of the Division of Botany and Plant Pathology, and Director of Botanical Survey, was born in Pietermaritzburg in the year 1900. He was educated at Michaelhouse School and the Natal University College, Pietermaritzburg, obtaining the B.Sc. degree in 1922 with Botany and Chemistry as major subjects, and the M.Sc. in Botany in 1923 under the late Prof. J. W. Bews. After a year with Messrs. J. L. Hulett & Sons, Amatikulu, as a sugar chemist he was appointed botanist in the Division of Botany, Pretoria, being transferred to Grahamstown a few days later. In Grahamstown he worked under the guidance of the eminent botanist Prof. Selmar Schonland, honorary member of the Botanical Survey of South Africa. On the retirement of Prof. Schonland in June 1926, Dr. Dyer was placed in charge of Botanical Survey of the south-eastern area of the Cape Province and was elected Hon. Curator of the Albany Museum Herbarium, Grahamstown. From 1931 to 1934 he represented the Union at the Herbarium of the Royal Botanic Gardens, Kew, and during this period he visited all the principal Continental Herbaria, returning to the National Herbarium, Pretoria, in 1934. Since the creation of the Division of Botany and Plant Pathology in 1939 he has been in charge of the Botanical Section.

Dr. R. A. Dyer.

Dr. Dyer accompanied the 1937 Carlisle Expedition to Tristan da Chuna, where he made some interesting scientific discoveries. In the same year his thesis on the "Vegetation of the Divisions of Albany and Bathurst" was accepted by the University of South Africa for the D.Sc. degree.

He is a life member of the South African Association for the Advancement of Science, and was President of Section C from 1941 to 1942. He has been Recorder for this Section during several annual meetings. He is a member of the South African Biological Society,

[Continued on page 358.

Broad Beans (Vicia Faba).

E. M. Nyenhuis, Research Horticulturist, Vaal-Hartz Experiment Station, Andalusia.

THE BROAD BEAN, believed to have originated in Algeria, is one of the hardiest beans in cultivation. Yet it does not receive the attention of growers that it deserves, nor is the bean during its season as popular for human consumption as are other peas and French beans, etc.

The Broad bean has a high nutritive value, is of easy cultivation and produces heavy yields over a long period when grown under favourable conditions. Usually only the shelled young green seeds are eaten. These are cooked and when served with a little butter and parsley sauce are delicious.

The plants thrive in almost any locality provided they are grown during the cooler months of the year. Their hardiness is remarkable and though the flowers are sometimes injured by frost, the plants soon recover and produce abundantly in spring. Experimental plantings in the Transvaal have indicated that the most suitable time for planting this crop ranges from the middle of April to the end of May. The crop is available from late September to middle December, a period when a shortage of many other vegetables is usually experienced.

High Yields.

At the Vaal-Hartz Experiment Station, broad beans have given high yields in comparison with other vegetable crops, e.g., 140 lb. and higher per 180 foot row. If the rows are spaced 3 feet apart, and the plants 6 to 9 inches apart in the rows, a total yield of 22,000 lb. may be harvested per morgen. Picking costs are relatively low as the pods are from 2 to 8 inches long and picking is very easy. The crop needs to be marketed quickly in well ventilated crates or trays since the pods soon turn black if bruised or become heated.

Apart from planting the seed at the most suitable time of the year in a good soil, i.e., one that is well supplied with organic material, phosphate and lime and irrigated when necessary, little care is needed. The best results are obtained when the seeds are planted 2 inches deep in moist soil so that germination occurs without further irrigation.

Cultivation.

Inoculation of seed before planting, as with other legumes, is usually not necessary. Once plants are above the soil, water may be given when necessary. The yellowing of the lower leaves or the falling over of the plants are indications of dryness at the roots. Shallow cultivation is recommended at all times so as not to injure the roots which are near the surface. The plants grow to a height varying from 2 to 4 feet. If only a few rows are grown, shelter from strong winds is necessary. The flowers are produced close to the stems and the pods mature from the base of the plant upwards.

When it is desired to harvest the seed for future planting, growers should select individual plants having the most desirable characteristics and mark them distinctively. The risk of cross-pollination is negligible.

Control of Insects.

The plants are not troubled to any extent by insects although aphis may become troublesome during November and C.M.R. beetles (black with yellow stripes) during December. Both can be controlled

easily. The aphis by an early spray of tobacco extract in water, and the beetles by hand-picking once or twice in the early morning when they are usually found clinging to the tips of the plants.

After the plants cease producing worthwhile crops and other vegetables are more plentiful, the plants can be turned into the soil as a useful green-manure crop.

It is, therefore, a very valuable crop and should be given a prominent place in every vegetable garden.

Compost :—

[*Continued from page 355.*

lucerne for a few years, or by establishing artificial pastures, or simply by allowing the soil to lie fallow as ordinary grazing until it is cultivated again. Nowadays, however, our supplies of animal manure are wholly inadequate for the needs of our cultivated soils, and the farmer usually finds it impossible to make use on a sufficiently large scale of the other methods mentioned. His problem is therefore how to supplement his limited supply of manure in such a way that sufficient organic material is incorporated into the soil. It is here where the making of compost plays such an important rôle. In the article referred to above it is explained how enormous quantities of " artificial manure " or compost can be built up with the use of a small quantity of animal manure. Soils used for the production of vegetables and soils under irrigation are particularly liable to the rapid loss of organic matter and should therefore receive preferential treatment when kraal manure or compost is applied.

It must be repeated most emphatically that the making of compost should not be regarded as a novelty or an emergency measure which will be out of fashion within a year or two. The process has come to stay. Every farmer who wishes to improve his soil should regard it as his duty to make compost. The use of compost in conjunction with the application of a good system of rotational cropping and the judicious use of artificial fertilizer will in the long run prove the most beneficial.

(Dr. J. P. van Zyl, Chief, Division of Chemical Services and Controller of Fertilizers.)

The New Chief of a Division :—

[*Continued from page 356.*

of which he has been Hon. Treasurer since 1935. He is a Life Member of the Pretoria Horticultural Society and Hon. Editor of its publication " The Pretoria Gardener ". For the past few years he has been corresponding member for South Africa of the American Amaryllis Society, and in 1941 was elected an Hon. Fellow of the Cactus and Succulent Society of America.

Dr. Dyer's scientific publications number over 60, the most noteworthy being his work in the " Vegetation of Albany and Bathurst " and two large volumes on the " Succulent Euphorbieae " in callaboration with two Americans, Messrs. Alain White and Boyd Sloane. In recognition of his scientific work he was awarded the Senior Capt. Scott Medal in 1942 by the South African Biological Society.

When Dr. E. Percy Phillips retired from the Service in February 1944 Dr. Dyer was appointed Chief of the Division, and at the same time took over the Editorship of Flowering Plants of South Africa, a work with coloured illustrations founded by Dr. I. B. Pole Evans in 1920 and now in its 24th Volume. During the war period he also served as a member of the Fibre and Medicinal Plants and Rubber Production Research Committees.

The Preparation and Use of Compost.

(Compiled by Dr. N. Viljoen, College of Agriculture, Potchefstroom.)

DURING the past few years the Department of Agriculture and Forestry has given considerable attention to the making of compost, and judging from the numerous inquiries addressed to this Department a large percentage of the farming population is displaying a lively interest in the matter. The progressive farmer has long since realized that the effective use of all plant and animal remains on the farm is one of the foundation stones of a sound system of farming.

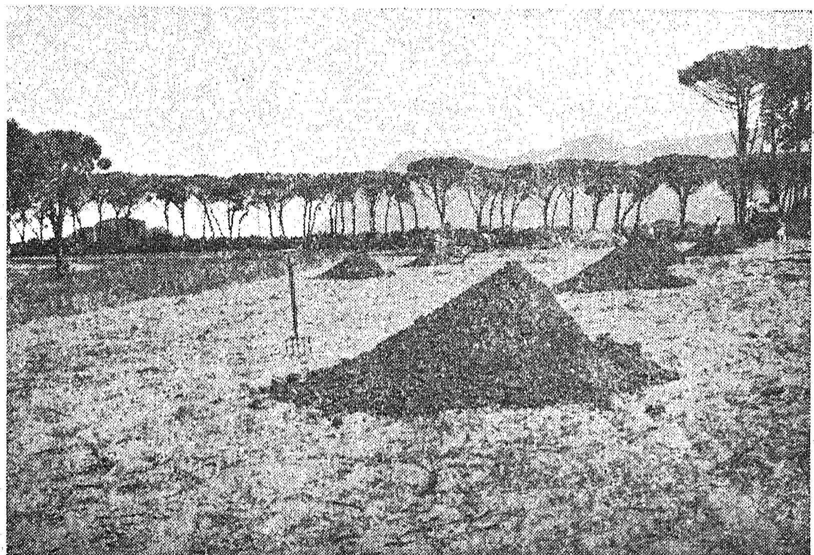

FIG. 1.—Compost heaps on the land. To prevent the nitrogen content from being lost, the compost should be scattered and ploughed in immediately.

Since considerable misunderstanding, uncertainty and even difficulty still appear to exist in regard to the manufacture and use of compost, it is hoped that this article will solve all such problems, and that it will help to persuade still more farmers to convert all waste products into compost and to put an end to the malpractice of wasting and burning organic material.

What is Compost?

Compost or artificial kraal manure as it is also called can be described as the product obtained when any matter of vegetable origin is broken up and disintegrated to a certain stage as a result of the action of micro-organisms (certain fungi and bacteria). This product has to a large extent the same characteristics as ordinary kraal manure, both as regards appearance and composition. Compost can be made from any vegetable material such as grass hay, wheat straw and chaff, weeds, etc.

Requirements for Success in Making Compost.

There are various well-known and effective methods of making compost, and the method followed will naturally depend on local conditions. Whichever method is followed, it is essential that con-

ditions which promote the activities of the fungi and bacteria responsible for the disintegration and decomposition of the organic material should be created. In order to ensure success in the making of compost, certain requirements must be satisfied. In view of this, the following factors are of importance and must be favourable.

1. *There must be sufficient moisture.*—In all compost-making processes, it is essential that the material should contain an optimum quantity of moisture, i.e., it must be neither too wet nor too dry.

FIG. 2.—With a heap of compost like this the fertility of the soil is assured

Generally speaking, the material should feel wet, but no free water should be visible. In the higher rainfall areas there will usually be sufficient moisture for complete decomposition of the material, especially when the kraal method of making compost is followed. In the drier areas, however, it is sometimes found that the material does not decompose satisfactorily, owing to insufficient moisture. In such cases, therefore, water must be added. A good plan is to soak the material for a few days in specially made trenches or holes before it is stacked in heaps. (This method is discussed later.) This is important, since moisture is the limiting or hampering factor in many areas.

2. *Air supply.*—Two kinds of bacteria are involved in the decomposition of organic material, namely those which require air (aerobic) and those which do not (anaerobic). For various reasons aerobic decomposition is preferable, since it takes place more rapidly and readily, and does not give rise to objectionable smells. In addition, the nitrogen compounds are more effectively retained in the material. Good ventilation also ensures a high temperature which is essential for the destruction of weed seeds and disease germs. In the case of heaps, it is imperative that the material should be loosely and lightly stacked, and that excessively fine material should not be used, since the free circulation of air is necessary for the promotion of the processes of decomposition. Furthermore, the heap must not be

trampled down, it must not be kept too wet, it must not be stacked too high, and freshly cut green material must be allowed to wilt before it is placed in the heap.

3. *Adequate food supply for bacteria.*—The bacteria and fungi require certain nutrients (mainly nitrogen and, to a lesser extent, phosphorus, potassium and calcium) for their development, and although ordinary plant remains will decay without the addition of these elements, since they are already present in the plant tissues, decomposition will take place too slowly. In the great majority of cases it will, therefore, be necessary to add these essential substances in a readily available form, and this is usually done by the addition of kraal manure, urine, artificial fertilizers or even plant remains (e.g., legumes) which are rich in these essential nutrients.

4. *Suitable reaction.*—If the mass is allowed to become too acid, the process of decomposition will be greatly retarded. The easiest and cheapest way to counteract an acid reaction, is to add finely ground agricultural lime (or wood ash, but not coal ash) to the material. A neutral or sweet medium must, therefore, be maintained.

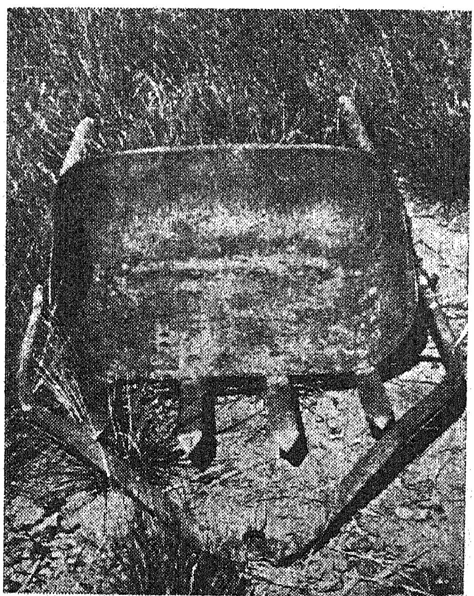

FIG. 3.—The compost scraper seen from above. Note the position of the prongs in relation to that of the draw-bar and the manner in which the edge of the scraper has been welded to the prongs.

5. *Suitable temperature.*—If all these factors are favourable, the bacterial action will be vigorous, and a rapid rise in the temperature in the heap will take place. The temperature is a very good indication of the course of the process; if it does not rise or suddenly falls after having risen, this is an indication that one of the factors mentioned is absent, or unfavourable. In that event an investigation must be made in order to rectify matters so that the process of decomposition can be resumed. If a suitable thermometer is not available, an iron rod or even a length of ordinary thick wire may be thrust into the heap and left there for a while. It may then be withdrawn from time to time and felt with the hand.

Since most farmers are familiar with the principles of silage making, a good rule to remember is, that the conditions which contribute towards the production of good silage should be avoided in the making of compost.

Methods of Making Compost.

In view of the fact that conditions vary from farm to farm and from area to area, it is impossible and even inadvisable to lay down or to prescribe hard and fast rules. If, however, the farmer understands the above-mentioned principles of making compost, he can easily vary his methods to suit his own particular circumstances.

In the main, two methods are recommended and followed, namely (1) *the kraal method and* (2) *the heap or trench method.* In the first-mentioned method animals are used, while in the second animals are not used directly.

1. *The kraal method.*—This is a very simple method and is recommended particularly for areas where the rainfall is high and where most of the farmers possess a considerable number of live-stock. It requires a minimum of labour, and, furthermore, is very well adapted to the fairly extensive nature of the farming systems practised in such areas. The method may briefly be described as follows: All vegetable waste material, as for example, wheat straw and chaff, maize stover and leaves, useless silage and hay, grass specially cut for this purpose, weeds, etc., should be worked into the

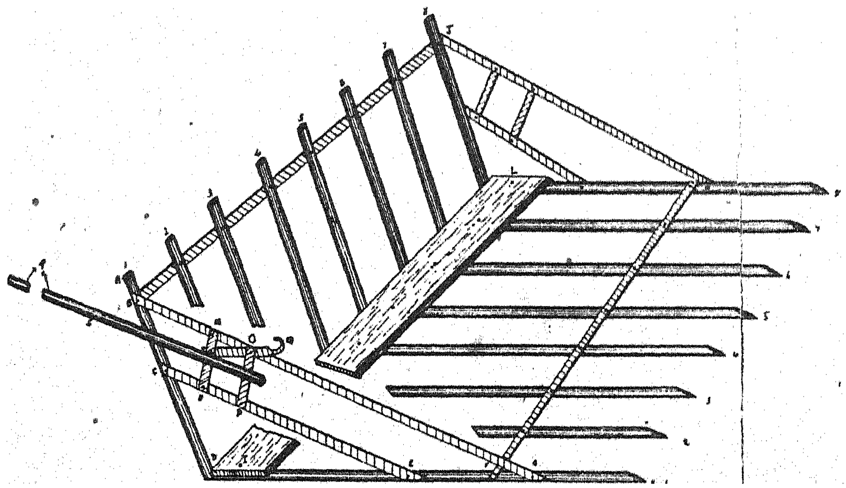

Fig. 4.—A compost scraper which can scoop up to 1,000 lb. of wet compost. (Details of construction obtainable from your nearest College of Agriculture.)

kraal, layer by layer. Begin with a layer 9 inches to 2 feet deep. This material absorbs a large percentage of the urine, and will become thoroughly mixed with the manure of the animals. Rain water and the urine provide the necessary moisture, and the urine and manure the necessary nutrients for the bacteria. Periodically a fresh layer of waste material is worked in, and to maintain a "sweet" reaction a little agricultural lime or wood ash (not coal ash) may be strewn over each layer. This will assist in the decomposition of the material. From this stage onwards various modifications may be introduced. Many farmers prefer to remove kraal manure to the lands only once a year (during spring). If the quan-

tity of waste material available is small in relation to the number of animals kraaled, the material may simply be left in the kraal until it is conveyed straight to the lands. If large quantities of material are available, however, the process of decomposition must be accelerated and in this case the partially decomposed material (i.e., as soon as it has become thoroughly mixed with manure and urine, and is reasonably moist), should be removed periodicallly and stacked in heaps. Depending on the number of animals kraaled, or in other words on the amount of manure and urine added, this period will vary from 14 days to a few months. The heaps should have

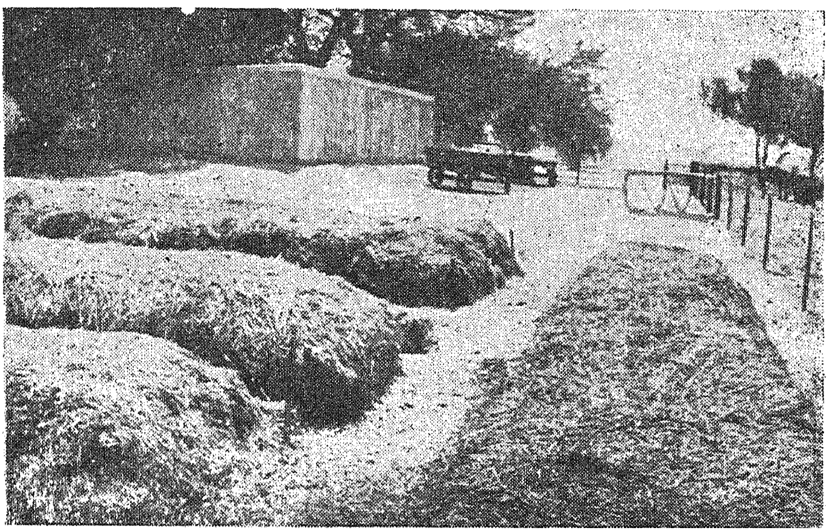

FIG. 5.—Compost heaps made according to the soaking-pit method.

more or less the following measurements: 6 ft. wide, 4 ft. high, and any convenient length.

The process of decomposition can be further accelerated by turning the heap periodically, due consideration always being given to the required factors mentioned. The costs involved in this practice are usually not justified, particularly where time is not an important factor.

The handling and removal of the material from the kraal are greatly facilitated by making use of a special dam or compost scraper, as described in *Farming in South Africa*, August and September, 1943, (see sketch). From 1 to 2 tons of compost per month per cow or ox can easily be made by this method if the animals are fed in the kraal.

(2) *The heap or trench method*.—The procedure here is to stack the compost material in a layer ± 1 ft. deep, 6 ft. wide and any convenient length, and to strew a thin layer of manure (kraal, stable or fowl manure) 1 to 4 inches thick over the top. The manure is then well mixed with the compost material and the whole layer thoroughly soaked with water. The heap is built up in this way layer by layer until it reaches a height of 4 feet. If no manure is available, an artificial fertilizer mixture may be substituted. Various such mixtures have been suggested, the following being good examples:—67½ lb. ammonium sulphate, 22½ lb. superphosphate and 60 lb. agricultural lime, or 60 lb. of ammonium sulphate, 30 lb. superphos-

phate, 25 lb. muriate of potash and 50 lb. agricultural lime. These quantities are per ton of dry material.

The layers must be lightly stacked otherwise the air supply will be inadequate, and decomposition will take place very slowly. If all the factors are favourable, the heap rapidly generates heat and the temperature remains high for a few weeks, after which it begins to fall. As soon as the heap has become cool or lukewarm (usually after 3 to 4 weeks), it must be worked over, the outer layers being placed inside and vice versa, and, if necessary, every layer must be moistened. Depending on the material used, it will probably be necessary to work the heap over again before it is ready for use on the land. This method usually takes from 3 to 4 months.

Owing to the dry climate and the absence of a sufficient number of animals, the kraal method cannot be effectively applied in most of the irrigation areas. Furthermore, the type of material (mainly wheat straw) available in such areas, does not absorb sufficient moisture when simply sprayed with water. The soaking pit method has been devised for such cases. The process is simple, and is easy and cheap to carry out, particularly in the neighbourhood of irrigation lands where wheat is cultivated. The straw is soaked for 2 to 3 days in a soaking pit, and then stacked in a heap at the side. The heap is built up in layers 9 to 12 inches thick and 6 ft. wide. A layer of manure 1 to 4 inches thick is placed on every layer of wet straw, and before the next layer is added, the manure and straw is thoroughly mixed with a garden fork or pitchfork. The heap is built up layer by layer, as described above, until it reaches a height of about 4 feet, after which a covering layer of straw, a few inches thick, completes the heap. No turning of the heap is necessary, and the compost is ready as soon as the heap is cold, i.e., within about 6 to 10 weeks. Excellent compost is obtained by this method, provided care is taken to satisfy the air and moisture requirements of the bacteria. In the case of wheat straw it is absolutely essential that the material should be thoroughly soaked in order to meet the moisture requirements. The labour costs will be reduced to a minimum by the construction of an effective soaking pit. In this connection the following points should be borne in mind:—(1) the pit should be so situated that it can be pumped or led full of water, and should be as near as possible to the threshing floor or chaff stalks; (2) it may be necessary or desirable to make the pit water-tight since this would eliminate repeated filling; and (3) a long, narrow pit is most effective. It has been found, for example, that a convenient heap, as described above, can be stacked with the contents of a pit 4½ ft. deep and 6 ft. wide. The length of both the pit and the heap will depend on local circumstances, and the pit may, of course, be made longer or broader, as the farmer prefers.

If manure is not available, one or other of the above-mentioned fertilizer mixtures may be used instead. It is also a good idea to spread a thin layer of soil over each layer of material.

Production Costs.

It is extremely difficult to give definite figures in regard to production costs since so many varying factors are involved. It has been calculated, however, that in many cases the labour costs were as low as 10d. per ton. In any case, every effort should be made to keep costs as low as possible. This can be done by carting and handling the material as little as possible, having the places for making compost conveniently situated, applying a method which is well suited to local conditions, and by the correct use of labourers, i.e., by

arranging the compost-making operations in such a way that they do not clash with other activities on the farm, etc. The farmer who uses his ingenuity and imagination, can do much towards reducing production costs or keeping them as low as possible.

Use of Compost.

An important question is: When is compost ready for use? The greatest losses undoubtedly occur when " ripe " compost is left lying in heaps, or when the process of decomposition is allowed to proceed too far. Compost should be used as soon as it is ready, and it is, therefore, important that the farmer should know when this stage

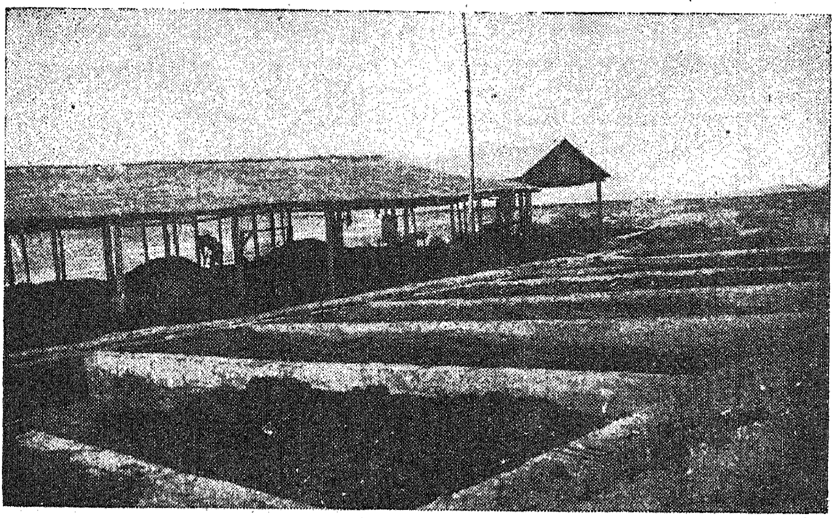

FIG. 6.—Manufacture of compost from municipal refuse pits and drying sheds.

has been reached. It is generally accepted that compost is ready when about 80 per cent. of the material can pass through a sieve with a half-inch mesh and when the coarsest constituents are so far decomposed that they can easily be pulverized in the hand. The general opinion is that compost should be applied and ploughed under before it is quite ripe. There is, therefore, a definite period within which the compost must be used in order to secure the best results, and the farmer should try to arrange the fertilizing of his lands accordingly.

After the compost has been conveyed to the lands and scattered, it should be ploughed under immediately, or as soon as possible, otherwise a large percentage of the nitrogen and even of the organic material will be lost.

In South Africa very few scientific experiments have been carried out to determine the fertilizing value of compost, and, consequently, no definite quantities can be prescribed for specific crops. Many practical observations have, however, been made, and it can be stated with certainty that crops like wheat, tobacco, potatoes and vegetables apparently respond much better to applications of compost than crops like maize, legumes or pasture grasses. From 6 to 40 tons per morgen are applied, depending on local conditions and individual circumstances, and 10 tons per morgen may be regarded as a good average. The numerous irrigation schemes, where intensive production is practised, undoubtedly offer the best opportunity for the manufacture and use of compost, since apart from the fact that water is always

 [Continued on page 370.

Influence of Cryolite and Sodium Fluosilicate on the Quality and Fluorine Content of Oranges.

Dr. P. J. Hamersma, Division of Chemical Services, Pretoria.

LIKE all other fruits, the orange is also subject to attack by numerous kinds of insects. One of these which may cause serious damage in orange orchards, is the American bollworm (*Heliothis obsoleta*). The moth lays her eggs in the blossom, and when the larva emerges it immediately attacks the small, young orange. It is at this stage that the pest must be controlled.

In the case of valencias the small oranges are already on the trees before the mature fruit of the previous season are ripe enough for picking. These mature fruit are also attacked and completely destroyed by the larvae.

The best known insecticides are the arsenic compounds of which arsenate of lead is the most important; but arsenical substances cannot be used on orange trees, since they adversely affect the quality of the fruit not only during the season of application but even during the two subsequent seasons. Such fruit is unsuitable for export purposes since the acid content is lower than the margin prescribed by regulation, which stipulates that if the total dissolved solids exceed 11 per cent., the acid content must not be lower than 0·5 per cent. Such oranges are also insipid and realize poor prices on the local market.

Experiments with Insecticides containing Fluorine.

It is essential, therefore, that other insecticides should be used on orange trees. The obvious insecticide is one of the fluorine compounds. Fluorine is also poisonous, but much less so than arsenic. It is a well-known fact, however, that small quantities of fluorine in drinking water may cause mottling of the teeth in children. Consequently, the maximum quantity of fluorine allowed on treated fruit is fixed at 0·01 grains per lb., or 1·4 parts per million.

In an extensive investigation which was carried out in two orchards in the Rustenburg district and in two in the northern Transvaal, an attempt was made to determine: (i) whether cryolite (sodium-aluminium fluoride) and sodium fluosilicate, both of which were used in the form of a dust and as a spray, adversely affect the quality of the ripe fruit, and (ii) whether undesirable quantities of fluorine are present in and on the ripe fruit. The treatments were repeated for several years in succession. The fruit trees were treated when the young fruits were about the size of a pea. In the case of Valencias the fruits of the previous season were still on the trees when the treatments were carried out. The Valencias were suitable for picking shortly afterwards. The results obtained were briefly as follows:—

Results.

The quality of the fruit in respect of the juice and acid content, total soluble solids and vitamin C was in no way adversely affected. In other words, the fluorine insecticides do not have the adverse effect peculiar to arsenical substances.

The fluorine content of the skin and of the fruit treated only in the early stage is negligible; as a matter of fact, it does not exceed that of untreated oranges.

 [*Continued on page* 370.

The Feeding and Care of Young Pigs.

W. A. Verbeek, Vaalhartz Experiment Station, Division of Animal and Crop Production.

THE present high prices of feeds as well as the prevailing scarcity in certain cases, make it imperative that special attention should be given to the feeding and care of pigs, if pig farming is to remain a paying proposition. In order to keep production costs as low as possible, it is essential that the maximum use should be made of waste farm products, kitchen refuse and pasture crops, which should be supplemented with properly balanced concentrate rations.

Young pigs possess the characteristic of making rapid growth and with proper feeding and treatment should show an average daily gain in weight of at least 1 lb. from the time of weaning until marketed at a live weight of 180 to 200 lb. Young pigs utilize their feed for maintenance and for the production of bone, flesh and fat, but if their growth is slow, a longer period must necessarily elapse before they are ready for marketing, with the result that the production costs are increased accordingly. Pig farmers should take advantage of this capacity for rapid growth by ensuring that piglets receive the correct treatment even before weaning and until the animals are marketed.

Feeding Before Weaning.

Piglets usually start eating at the age of three weeks, and it is advisable that attention should be devoted to their feeding even at this early stage so that they will not suffer a set-back when the suckling period ceases. All the nutritional requirements for the rapid growth of the piglet are provided by the sow's milk, the quantity produced increasing from parturition until the third week, after which a gradual diminution takes place. If young pigs are to maintain a steady rate of growth the sow's milk will have to be supplemented with extra feed from the third week onwards. Protien-rich feeds such as skimmed milk or buttermilk, fish meal, meat meal and blood meal, mixed with mealiemeal, kaffircorn meal or barley meal, etc., can be given to young pigs by means of creep feeding. A concentrate mixture consisting of, for example, one part of mealie-meal and four parts of skimmed milk; or four parts mealiemeal and one part meat meal (fish meal or blood meal) will give excellent results.

The sow and her litter should preferably be put on pasture (especially lucerne) as soon as possible after she has farrowed—even after the first week if weather conditions permit. In addition to the excercise and the better hygienic conditions, good quality pasturage also provides valuable nutrients. If no pasturage is available, the sow and her litter should be placed in a paddock where the animals can get sufficient exercise. A paddock measuring about 15 by 50 yards should be suitable for the purpose. It is desirable that the sow and her litter should receive a regular supply of green feed. Young boars which are not intended for breeding purposes, must be castrated during cool weather when they are about six weeks old, so that they will have recovered from the shock of operation at the time of weaning.

Feeding After Weaning.

Eight weeks has been found to be a very suitable age at which to wean pigs. By that time the milk production of the sow has diminished considerably and the young pigs can make effective use

of other feeds, while the sow is also free to be served again. When the piglets are weaned, the loss of mother's milk must be made good by feeding concentrate rations consisting partly of protein-rich feeds of animal origin. Skimmed milk has the highest value as a supplementary protein feed, and also gives better gains in weight. The value of skimmed milk diminishes, however, if a larger quantity is fed than is required to balance the ration. Buttermilk has the same value as skimmed milk. Skimmed milk should therefore be used judiciously and it is unnecessary to feed any pig more than one gallon of skimmed or buttermilk per day. If superfluous quantities of skimmed milk are available on the farm, during certain periods of the year, farmers are advised to use the surplus for conversion into casein which can then be added to the concentrate ration in the form of a meal when required. Directions for the preparation of casein are obtainable from the Department. About 1 lb. of the dry casein has the same nutritional value as 10 lb. of skimmed milk, and the amount added to the concentrate ration need not be more than 5 per cent.

Weaned piglets can be given 3 to 4 lb. of skimmed or buttermilk for every lb. of mealiemeal fed. This quantity can be gradually reduced to 1 or 1½ lb. for every lb. of mealiemeal when the animals have attained a weight of 150 lb. The rations from the time of weaning until a weight of 100 lb. is reached, should contain approximately 18 to 20 per cent. proteins. Between 100 and 150 lb. the figure should be approximately 15 per cent. and from 150 to 200 lb. about 10 to 12 per cent.

Examples of Concentrate Mixtures.

A. *For pigs weighing up to 100 lb.*

	Without Pasture				On good Pasture.		
Mealiemeal	80	65	80	—	88	—	73
Barley meal	—	—	—	85	—	92	—
Oatmeal	—	20	—	—	—	—	20
Fishmeal or meat meal	10	5	7	5	6	4	7
Groundnut oilcake meal *or* Soybean oilcake meal *or* Linseed oilcake meal	5	5	8	5	6	4	—
Lucerne meal	5	5	5	5	—	—	—

B. *For pigs weighing from 100 to 200 lb.*

	Without Pasture.			On good Pasture.			
Mealiemeal	82	85	—	92	70	75	—
Barley meal	—	—	89	—	—	—	96
Oatmeal	—	—	—	—	25	20	—
Fish meal or meat meal	4	5	3	4	5	5	4
Groundnut meal *or* Soybean meal *or* Linseed meal	4	5	3	4	—	—	—
Lucerne meal	10	5	5	—	—	—	—

In the above mixtures meat meal or white fish meal can be replaced by skimmed or buttermilk in the ratio of about 1 to 10, respectively.

In general, pigs can be given the following quantity of concentrate feed: At the age of 8 weeks (when their weight is approximately 30 lb). 2 lb., which is increased by ½ lb. every fortnight

up to a maximum of 6 lb. until they are marketed. In the case of pigs which are allowed to graze and are fed on waste farm products and kitchen refuse, the quantity of concentrates can be reduced. The nature of the waste feed, etc. will determine the composition and the quantity of the concentrates to be fed but under no circumstances should the amount of concentrate feed be less than 2 lb. per pig per day. On young lucerne pasturage, for instance, a daily ration of 2 lb. of concentrates made up as indicated above will provide adequate supplementary feed for one pig. The rate of the gain in weight will indicate the quantity of supplementary concentrates to be provided.

In making up concentrate mixtures it should be borne in mind that the ration should not contain more than 7 per cent. fibre, otherwise the weight increase will be retarded and more feed per unit of weight gained will be consumed. The mineral and vitamin requirement of pigs are usually provided in a well-balanced ration. Good pasturage provides an adequate supply of minerals and vitamins, and also supplements mineral deficiencies in cereals, but for pigs in a dry paddock a mineral mixture such as, for example, 3 parts bonemeal and 1 part salt, can be added to the concentrate ration at the rate of 2 per cent.; in addition green feed must be provided.

Lucerne meal is eliminated from concentrate mixtures when pasturage is available. If a good quality lucerne meal is available, more than just 5 per cent. can be added—10 per cent., for instance as shown in one case under part B of the example given of concentrate mixtures. If lucerne is not available in the form of meal, lucerne hay can be fed in racks.

Pasture and Shelter.

The utilization of grazing reduces the feeding costs and experiments have shown that young pigs on lucerne pasture consume ¼ less feed per 100 lb. gain in weight than pigs fed in a dry paddock. It is not desirable, however, to finish baconers on pasturage. When they attain a weight of from 150 to 160 lb., they should be finished in a dry paddock or sty for the production of prime baconers.

Greater value is obtained from pasturage if a system of rotational grazing is practised, and better use is made of the pasture if it is allowed to be grazed in the young, growing stage, since it is then more readily digestible.

Damage to permanent pastures like lucerne, for example, can be prevented by ringing the pigs. The provision of shade or shelter against the sun (which is always desirable, and absolutely essential in hot areas) together with the feeding of a balanced concentrate ration, will also help to limit the damage to a minimum. Another way in which damage can be prevented to a certain extent is to keep the pigs on the pasturage for limited periods only, and to provide small patches at a time.

The use of an electrified fence around pasturage for pigs is very effective. At the Vaalhartz Experiment Station lucerne pasturage is controlled by electrically charged barbed wire stretched about 12-15 inches above the ground. The cost of fencing a series of grazing paddocks in this way is very low. The costs of the device justify its use in the case of pigs.

In the hotter parts of the country the provision of wallows is almost as essential as the provision of shelter against the sun. A permanent cement wallow can be constructed at little expense. For the control of fleas a little used motor oil can be poured on the water in the wallows from time to time.

The daily provision of clean, fresh drinking water is important, and should on no account be neglected.

Finally, it will pay pig producers to wash pigs thoroughly on the farm before sending them to the market, and to dispatch them in a clean truck or lorry. Such animals are more likely to catch the eye of the prospective buyer than pigs with a dirty, unkempt appearance.

The Preparation and Use of Compost:—

[*Continued from page* 365.

available on such schemes, it is generally accepted that the yields obtained by the application of organic material, and particularly nitrogen, are much better under irrigation than under ordinary dry-land conditions.

Conclusion.

The manufacture and use of compost is an established practice in many parts of the world, especially in the East where its principles have been applied for centuries with very good effect.

If the process is carried out correctly, there is no reason why compost should not enable farmers in this country as well to exploit and utilize their resources to the fullest extent. As the supply of kraal manure dwindles and ceases to satisfy the demand, farmers will be compelled to use a substitute, and in this respect compost will meet their requirements most effectively. In view of the fact that the fertility of our soils must be preserved not only for the present but also for the future, it is the duty of every farmer to give serious consideration to the making and use of compost.

Influence of Cryolite and Sodium Fluosilicate on the Quality and Fluorine Content of Oranges:—

[*Continued from page* 366.

Mature Valencias which were treated again shortly before being picked, contain comparatively high quantities of fluorine on the skin. If such fruit are not yet ripe enough for picking and it is already time for the young fruit to be treated, it is essential that the oranges should be throughly washed with water when picked. Washing by hand or with a washing machine such as that used by the Rustenburg Coöperative Packhouse, is quite effective.

Where spraying was carried out, the fluorine residue exceeded that of the dusting. Further particulars which will prove of interest to citrus growers are given in a bulletin of which the above is a very brief summary.

The title of this bulletin is: "The Influence of the Insecticides, Cryolite and Sodium Fluosilicate on the Quality and Fluorine Content of Oranges", Science Bulletin 236, Price 3d. Obtainable in English only from the Chief, Division of Chemical Services, Private Bag, Pretoria.

Protection of Stored Grain by Means of Dusts.

Dr. M. J. Oosthuizen, Entomologist, Division of Entomology.

FOR many centuries already man has been vitally interested in the protection of his grain reserves from insect attack, and in recent years much success has been achieved by the use of fumigants. While effective fumigation will destroy all insect life present in grain, it will, however not prevent such grain from becoming re-infested. Consequently, methods of combating grain insects by the use of both inert and poisonous dusts have received serious attention during the

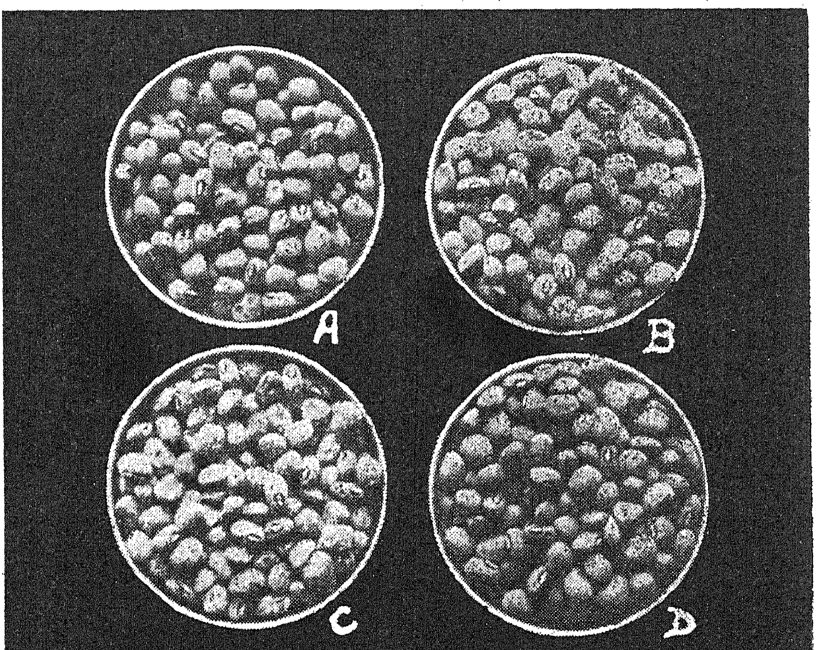

FIG. 1.—New Era cowpeas treated with kaolin (A), talc (B), lime (C), and copper carbonate (D).
[Photo: Dr. Saunders.

past few years. As a result of careful research work much has been accomplished in perfecting these methods and in developing dusts of high insecticidal efficiency.

The fact that certain native tribes still mix wood or aloe ash with their grain indicates that this method had been in vogue for many centuries in South Africa, and a brief survey of native methods of grain preservation will not be out of place at this juncture.

It is the purpose of this article to give the results which have been obtained in determining the efficiency of various dusts against the rice or maize weevil, *Calandra oryzae* Linn., and the cowpea bruchid (weevil), *Callosobruchus chinensis* Thunb. The experiments here described were conducted at the Potchefstroom College of Agriculture during 1936-37. Recent advances as gleaned from 80 references on this problem are also discussed.

A Review of Protective Methods Used by Natives.

The Bapedi tribe of natives in Potgietersrust District and in Sekukuniland mix their grain with aloe (segopa) ash. The dried aloe leaves are first burnt and the ash collected and sifted through a grass sieve so as to remove lumps and stones. Winnowed grain is then spread on a clean floor and sprinkled with the ash at the rate of approximately 1½ to 3 lb. per bag (200 lb.) of gran. The mass is then thoroughly mixed and placed in baskets (dišexo), bags or other receptacles, and stored in huts. In the case of beans the process is slightly different, in that the beans are first damped with water before the ash is thrown over them. Once the treated grain is stored no further protection, such as sealing the baskets and smearing them with dung, is necessary. It is claimed that if the process is properly carried out, grain can be stored with perfect safety for two years. The ash has no harmful effect on viability or on the taste when the grain is used for food or beer.

In the Lydenburg area the Bakone tribe use aloe ash at the rate of approximately 3½ lb. per bag of grain. After mixing, the grain is stored in containers in August. During February to March the treated grain is removed and spread on a flat floor in the sun between the huts. Any weevils which are present are either destroyed or driven out of the grain by the heat of the sun. The grain is then replaced and can be safely kept for several years.

The Amandebele tribe in Potgietersrust also use aloe ash. They claim that grain treated with this ash will remain immune for approximately 4 months, after which a further application of ash is necessary. Seed maize on the cob is suspended from rafters in their huts and these ears get thoroughly smoked, becoming covered with a layer of soot which is regarded as a general protection against weevils. This method is also practised by the Balobedu in the Northern Transvaal.

The Basutos in the Thaba'Nchu area sprinkle the outside of their *sesiu* (grain basket) with a water extract of aloe as a protection against insects. To protect grain against rodents, a layer of sand is placed around the receptacle so that no holes can be made.

The Malabochs in Pietersburg and the Zulus in Natal mix their grain with wood ash before storage. Sufficient ash is added to leave the hand " white " when inserted in the grain.

No ash is used by the Shangaans, the Bavendas, and the Xosas. Bark of the *Muoze* (probably *Spirotachys* sp.) is placed on the top of the grain, as it is claimed by the Balobedu that the aromatic odour of this plant will repel weevils.

Where grain is stored in underground pits no ash is added. These pits are called *khilitesi* by the Balobedu. All insects present in this grain will die as a result of excessive heat and carbon dioxide evolved by the rapid respiration of the moist grain. Pit-stored grain goes mouldy and out of condition in a relatively short time depending on the moisture present in the pit. It is erroneously claimed that maize stored in pits for a period of two months will not afterwards become weevily even if stored in bags. Pit-stored grain is sometimes badly attacked by termites called white ants. The Shangaans and Bavendas claim that grain in pits, situated in cattle kraals, are very seldom attacked. Possibly the urine and dung of the cattle act as repellants. Plastering of the inside of the pit with dung and burning out a pit before storage is said to be equally effective against termites.

Experimental Method.

In the first series of experiments carried out at Potchefstroom, sound samples, each 200 grams in weight, of Potchefstroom Pearl maize, with a moisture content of 10%, were transferred to different fruit jars. The following dusts were added in ratios of 1 to 50 parts (designated as 1-50) by weight of seed, 1-100 and 1-200 to each respective sample: lime, kaolin, magnesium oxide, flowers of sulphur, wood ash (*Acacia karoo*), aloe ash (*Aloe aculeata*), dry crushed stinkblaar (*Datura stramonium*) and khakie-bos (*Tagetes minuta*) leaves and a proprietary dust called Jan Muthate's powder, which passed a 72-mesh to the inch screen.

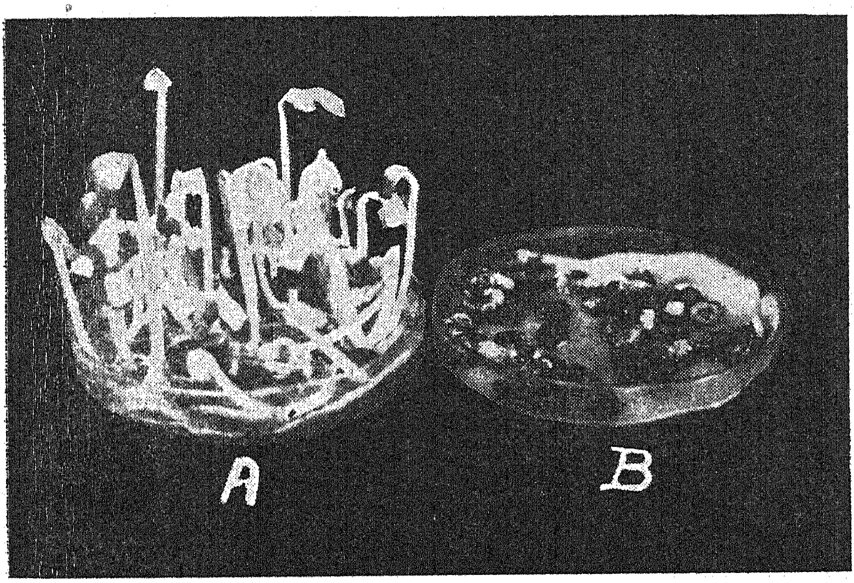

FIG. 2.—The germination capacity of cowpea seed. Series A was treated with lime (1-50) and series B was left untreated. Both series were subjected to infestation by the cowpea bruchid.

[Photo: Dr. Saunders.

Copper carbonate was used at ratios 1-250, 1-500 and 1-1,000 parts of seed. Mixing was done by rotating each fruit jar until all seeds appeared to be covered with a thin layer of dust. Treatment with each ratio of dust was conducted in quadruplicate, so as to apply statistical methods of analysis. Each sample was then artificially infested with 50 one-month old maize weevils. All jars were closed with screen lids and breeding was allowed to continue for a period of 96 days, from the middle of January to the last week of April. At the conclusion of the experiment, each sample was examined for weevils as well as for loss in grain weight.

In a second series of experiments, samples of New Era cowpeas, each sample 300 grams in weight, and with a moisture content of 9% were treated with different dusts as indicated in Table II. There were three replications for each treatment. Sixty newly emerged bruchids were introduced into each jar, and the closed jars were kept at a constant temperature of 26·5° C. for a period of 4½ months. The length of the life cycle of this species is about one month, so that at least 4 generations could have completed their development during

this period. At the conclusion of the experiment each sample was sifted, weighed and the number of bruchids recorded.

In a later experiment the same variety of cowpeas was treated with different ratios of kaolin as indicated in Table III. Each sample weighed 100 grams, and was infested with 30 newly emerged adult beetles and kept for a period of 2½ months at 26-28° C. There were four replications for each treatment. The loss in weight and the weevil increase in each sample was recorded.

Results and Discussion.

TABLE I.—*The Treatment of Maize with different Dusts.*

Dust.	Treatment.	Increase of Weevils.	Loss in Weight.
		%	%
Wood Ash.........	1- 50	34·6	1·8
	1-100	75·6	2·1
Aloe Ash..........	1- 50	26·0	1·1
	1-100	46·6	1·9
	1-200	36·0	1·1
Jan Muthathe......	1- 50	64·0	1·9
	1-100	95·6	2·8
	1-200	105·0	3·5
Datura............	1- 50	103·0	3·1
	1-100	142·6	4·0
Tagetes............	1- 50	146·6	4·0
Mag. oxide.........	1-100	123·0	3·8
Lime..............	1- 50	25·0	1·0
	1-100	22·6	1·0
	1-200	69·6	2·1
Sig Diff. (P = ·05)	—	43·9	—

In the table of analysis only those materials which appeared to be promising were included. This procedure was adopted in order to obtain a smaller error variance for purposes of comparison. Data on copper carbonate were not included as the insects in all samples treated with this poison had died before breeding could take place.

It may be concluded that treatments of maize seed with lime (1-50, 1-100) and with aloe ash (1-50) are significantly better in preventing weevil development than treatments with any of the other dusts. Furthermore, it would appear that treatments of seed with Jan Muthathe's powder, stinkblaar, khakie-bos, magnesium oxide or sulphur have no beneficial influence as far as the prevention of weevil infestation and development are concerned. As regards weevil mortality in the different samples, it was noted that all weevils had died in the copper-carbonate treatments, 50% in the lime treatments, 39% in the aloe-ash treatments, 37% in the wood-ash treatments, and 8·5% in the untreated samples. The loss in grain weight was insignificant in samples treated with lime, wood and aloe ash. The loss in weight in the untreated series was 5%.

The analysis of the data indicates that there is no significant difference between the first ten treatments, but they are all eminently better than table salt or no treatment (control) in preventing or limiting the continued breeding of cowpea bruchids. In view of the disparity in the rate of infestation between the effective and ineffective treatments, the results obtained in the former case were analysed separately in order to determine whether there would be any signifi-

cant difference between these respective treatments. No significant differences were, however, obtained. A determination of the dry weight of seed showed a loss of 38% in the control, while no appreciable loss was evidenced in case of the effective treatments. While the germination was 94% in the series treated with lime, it was only 4% in the case of the untreated or control series.

TABLE II.—*The Treatment of Cowpeas with different Dusts.*

Dust.	Treatment.	Increas in Bruchids.
		%
Lime	1– 50	8·3
	1– 75	5·0
Mag Oxide	1– 100	22·1
	1– 200	25·0
Kaolin	1– 50	12·8
	1– 75	25·5
Barium Fluosilicate	1– 500	50·0
	1–1000	35·0
Sod. Fluosilicate	1– 500	48·3
	1–1000	73·8
Sod. Fluoride	1–250	3·8
	1– 500	10·0
Cryolite	1– 250	23·3
	1– 500	98·8
Paris Green	1– 250	25·5
	1– 500	26·7
Calcium Arsenate	1– 250	36·1
	1– 500	61·1
Copper Carbonate	1– 250	9·5
	1– 500	20·1
Sodium Chloride*	1– 25	3773·0
	1– 50	3866·0
No Treatment	–	3397·0

* No significant difference from "no treatment" at the 5% level of probability.

TABLE III.—*The Treatment of Cowpeas with Kaolin.*

Treatment.	Increase in Bruchids.	Decrease in Weight.
	%	%
1– 50	8·3	0·1
1–100	11·1	0·1
1–150	153·3	3·2
1–200	33·3	1·2
1–400	1386·6	10·2
Control	8129·3	31·6

The results as indicated in Table III show the beneficial effect of all treatments over the control. Treatments 1-50 and 1-100 are extremely effective in preventing bruchid multiplication, and subsequent loss in weight. The seemingly ineffective results obtained at a treatment of 1-150 is ascribable to indifferent mixing of dust and cowpeas. It should also be pointed out in this connection that it is sometimes very difficult to induce an infestation in the small samples used.

Dusting with kaolin at the rate of 0·5% by weight is not recommended for practical purposes.

The Lethal Effect of Insecticidal Dusts.

Various views have been expressed in connection with the action of different dusts on insects. According to earlier research workers, the powdered carbonates of magnesium and calcium, when ingested, release carbon dioxide which dilates the mid-gut and destroys the epithelium layer. Another theory is that dusts interfere with feeding of the insects and that death is actually due to starvation. It should be pointed out that dusts do interfere with the movement of the insect's mouth parts and hence reduce the damage which may be caused by them. A more recent and acceptable theory is that these dusts remove moisture from the body of the insect and that death is due to desiccation. It appears that grain insects are covered by a "waterproof" fatty film which serves to minimise evaporation of body moisture. Any sharp crystalline dust will disrupt the continuity of this film and hence assist evaporation. It has been found with some weevils that death takes place as soon as the body moisture is decreased from 48 to 32% of the body weight.

Dusting of seed will in no way harm the immature stages of the two grain weevils or the cowpea bruchid, since development is completed inside the seeds and, therefore, out of reach of the dusts. As soon as adults emerge, however, the lethal action of the dust commences.

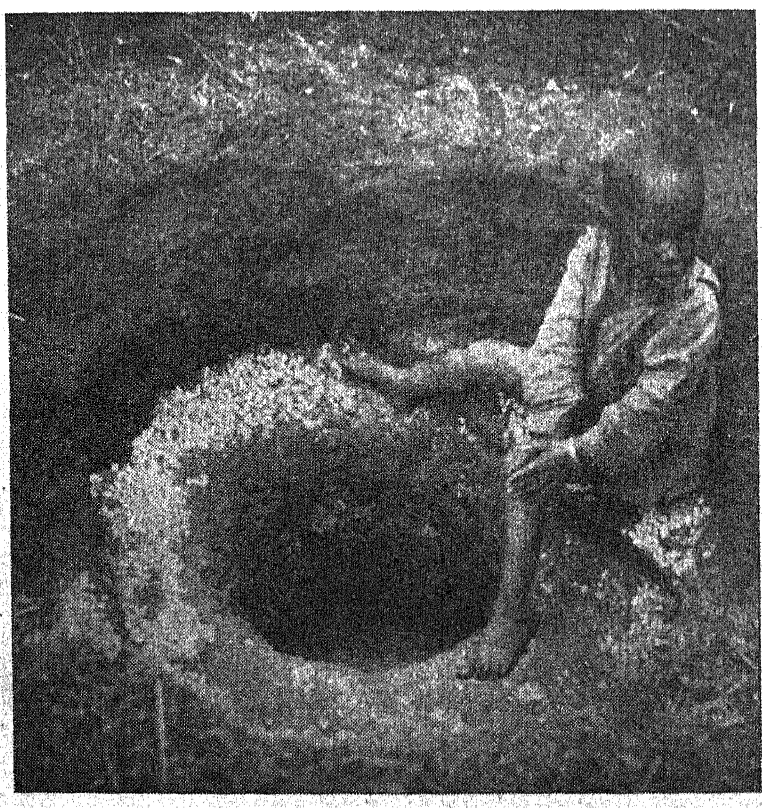

FIG. 3.—An underground grain pit (khilitesi) in Modjadjis location, Northern Transvaal. The pit is generally funnel-shaped with a capacity of from 10 to 60 bags or more.

[Photo: Mr. J. D. Krige.

Factors Effecting the Efficiency of a Dust.

(1) *Size of Dust Particles.*—According to literature, the shape and chemical constitution of an inert dust are immaterial, but particle size and intrinsic hardness are of paramount importance. Experi-

FIG. 4.—A native granary in Ovamboland, S.W.A. The largest grain basket has a capacity of 150 bags.
[Photo: Mr. Schettler.

ments with a proprietary dust called "Naaki" which consists of almost pure quartz, indicated that the highest insecticidal efficiency was obtained where the particle size ranged from colloidal to 5 microns (one micron equals 0·001 mm.) and that a particle size ranging from colloidal to 150 microns (μ) proved to be less effective. The method of grinding also influences the potency of a dust. Since the degree of disintegration produced by ordinary grinding processes is not sufficient, special colloidal mills are used to prepare finely divided particles for industrial use.

(2) *Moisture and Relative Humidity.*—Experiments have shown that the drier the grain, the more effective is the dust. For instance, lime gave excellent protection to grain with a moisture content of 10 to 12%, but only slight protection where the moisture content was 16%. This is very important.

The lethal effect of a dust is also more pronounced at a low than at a high relative humidity in the atmosphere. For example, all granary weevils, *Calandra granaria*, Linn., were killed in one day at a relative humidity of 21% and a temperature of 23° C., while it took 20 days at the same temperature and a relative humidity of 100% to kill them.

(3) *Temperature.*—The higher the temperature, the greater the efficiency of a dust. Granary weevils died in 2 days at a temperature above 30° C. and in 10 days at a temperature of 10° C.

(4) *Kind or Species of Insects.*—Evidently certain species of grain pests are more readily affected by dusts than others. For instance, lime proved to be much more effective against the bean bruchid (weevil). *Bruchus obtectus* say, than against the cowpea bruchid, *B. quadrimaculatus* Fab. This is mainly due to the fact that the former species lays its eggs loosely among stored beans, while the latter species glues its eggs on to cowpea seeds. Larvae as

well as adults of the bean bruchid are thus exposed to the desiccating action of the dust, while only adults of the other species come into contact with it.

Furthermore, hairy insects such as larvae of Dermestid beetles are more resistant than smooth larvae belonging to the family Tenebrionidae.

(5) *Size of Insects.*—Small insects are more readily affected than larger insects. It is, therefore, to be expected that the flat grain beetles, *Laemophloeus* sp., will be more susceptible to dusts than the large " meal worm " adults, which belong to the genus *Tenebrio.*

(6) *Age of Insects.*—Young granary weevils and bean bruchids are more sensitive to dusts than older weevils or bruchids. Resistance evidently increases as the chitin covering the insects becomes harder.

The Application of Dusts.

Where small quantities of seed are to be treated and stored, they may be placed in jars or paraffin tins with the required amounts of dust, and the closed containers then shaken for several minutes.

For larger amounts of seed, mixing may be carried out in an old barrel churn, a rotary oil-drum or a gravity mixer, which may be constructed from a 44-gallon oil-drum, a cement mixer or a special motor-driven commercial machine. Another satisfactory seed treater consists of mixing chute made of wood.

Where grain in bulk is treated, the question of application becomes somewhat complicated. In the first place, clogging of the dust in its container may interfere with its introduction, especially where an ordinary gravity applicator or metal hopper is used. A roller-feed-hopper could, however, be devised which would feed the dust at the required rate directly into the grain stream as it enters the bin or tank. In the second place, a dense dust cloud may form during application. The elimination of this cloud is highly essential because of the danger of silicosis where silica dusts are used. Furthermore, in view of the fact that dust explosions may occur, it is considered necessary to determine the degree of inflammability of the various dusts.

Conclusion.

While the treatment of grain with some of the most promising dusts did not give complete protection against weevils and bruchids, it did, however, limit the continued breeding of these pests to a very large extent. In this way the rate of depreciation of the grain and beans was considerably retarded. It would appear as if these dusts can be more successfully applied against cowpea bruchids than against maize weevils. Further experiments are being conducted on a large scale, using some of the dusts which performed so well in the tests described above. In these experiments the particle-size of the dust will also receive attention.

Since some " inert " dusts such as kaolin, lime and magnesium oxide are widely used as corrective agents medically, it is not considered necessary to remove these dusts from the grain before use as human or animal food. Removal can, however, be adequately performed by the ordinary cleaning processes prior to milling. Copper carbonate, Paris green, the fluosilicates and the arsenates are potent poisons and should only be used for preserving grain intended for seed purposes.

In view of the fact that both the moisture content of the grain as well as the relative humidity of the air will reduce the efficiency of a dust, the successful application of this method in the damp coastal regions of South Africa is questionable.

With a better understanding of the factors involved in the successful use of a dust, this method may, in time, supersede some of the ordinary methods of grain preservation. Where pre-harvest infestation of grain is of importance, fumigation will still have to be resorted to for the destruction of immature stages inside the grain. Dust treatment may then be applied. The dosage recommended for grain in bulk is 1 to 2% by weight of "inert" dust or 0·2 to 0·4% of poisonous dust.

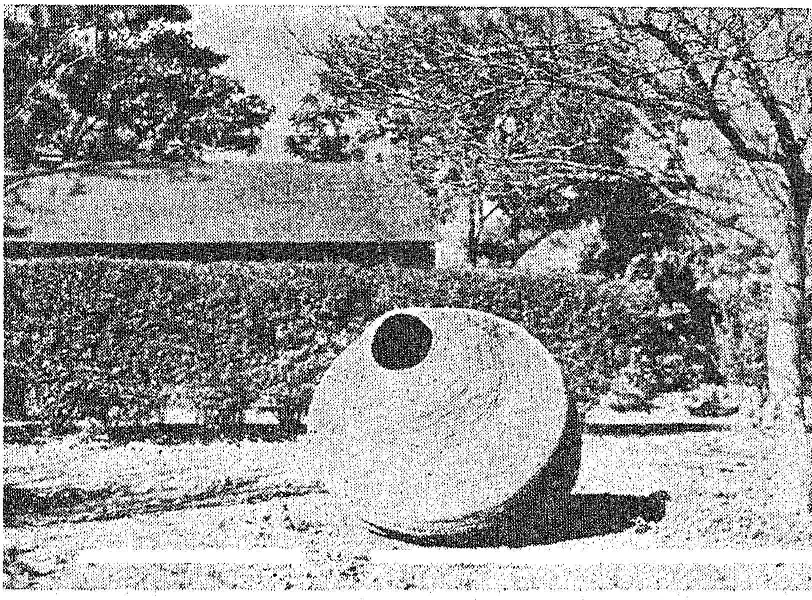

FIG. 5.—Native grain basket (sešexo) used in the Lydenburg area. It is oval-shaped with a capacity of from 4 to 40 bags.

[Photo: Dr. B. Smit.

Several proprietary insecticidal dusts have already appeared on the market. Notable ones are "Vivianite" (Russia), "Naaki" (Germany), "Dutox" and "Activated Prophyllite" (America), "Neosyl" and "Almicide" (England) and "Katelsousse" (Egypt). These will no doubt be followed by many more.

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(* From Rev. of Applied Entomology.)

Geese on the Farm.

GEESE are natural feeders of grass and herbage, and as there is generally sufficient for their needs on the average farm during the greater part of the year, the farmer's wife can, without much trouble, supplement her income by keeping a flock of these birds.

Generally, geese can be plucked every six weeks or two months, and there is always a good demand for the feathers and down.

Geese will seek shelter during bad weather, but as a rule they dislike being housed. Nevertheless, a dry and warm place should be held in readiness, as young goslings and plucked birds require protection during inclement weather.

The Embden is the most popular goose. It is a large snow-white bird. The geese are good layers and sitters, and they mother their young well. Geese begin to breed in early spring, and the largest and most perfect birds should be kept for breeding. Geese are fully mature at the age of two years and from then are in their prime for breeding up to the age of six or eight years, but often they breed well for many years longer.

It is never necessary to separate the sexes. The gander is a great help to the goose in rearing the young.

Sufficient nests should be provided near the homestead to discourage the birds from breeding abroad. Barrels, boxes or conical-shaped structures of sticks and covered with grass, sacking, reeds, etc., make attractive nests.

Goose eggs take from 28 to 32 days to hatch, and are successfully incubated by a goose, fowl, muscovy and duck. As a general rule geese eggs do not hatch as well as fowl eggs in an incubator. The eggs should be tested on the 8th and 17th days and all infertile eggs and those containing dead embryos should be removed.

A bird sitting on eggs should be given a good feed of grain daily.

Goslings are hardy, and at an early age they become independent and are able to fend for themselves. They are ready for their first meal at the age of 24 to 36 hours, and may be fed on the same food as ducklings. Being natural grazers, they should receive an ample supply of finely chopped green food. To obtain a large-sized body in the adult stage, they must be fed liberally on mash for the first four months of their lives.

[E. F. Lombard, Professional Officer (Poultry), East London, Division of Animal and Crop Production.]

Popular Bulletins.

(1) Calf Rearing—Bulletin No. 224. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

(2) The Export of Fresh Grapes from the Union of South Africa during the Ten-year period, 1930-39—Bulletin No. 225. Price 6d. Obtainable from the Chief, Division of Horticulture, Pretoria.

(3) Soft Cheese as a Food—Bulletin No. 229. Price 3d. Obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

New Bulletins.

"Poultry Farming", Bulletin No. 241, price 1s.

"Cactus and Oldman-Saltbush as Feed for Sheep", Bulletin No. 236, price 6d.

"Soyabeans in South Africa", Bulletin No. 240, price 6d.

The New Dessert Peach "Boland"

A. F. de Wet, Pomologist, Western Province Fruit Research Institute, Stellenbosch.

"BOLAND", the new type of dessert peach which might in the future prove to be of importance to the fruit industry of the Western Province, originated largely by chance.

This variety is a further product of the campaign launched in 1932 by Professor O. S. H. Reinecke, to find a better canning peach as a result of which Kakamas was produced. In this campaign

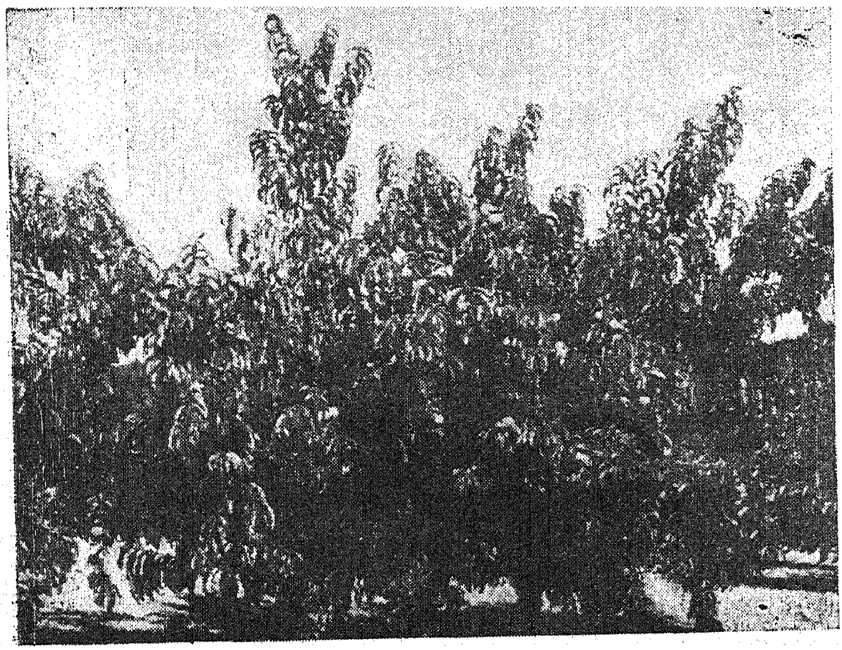

FIG. 1.—The original tree of "Boland".

FIG. 2.—A "Boland" branch.

growers were urged to forward fruit or stones of promising types to the Stellenbosch-Elsenburg College of Agriculture.

Amongst a number of seedlings raised at Elsenburg from white-fleshed clingstone seed submitted by the late Col. Alston, of Seven Rivers, Banhoek, the writer observed and retained one vigorous tree which cropped regularly and appeared to be resistant to "delayed foliation".

This vigorous seedling tree (Fig. I) cropped so well and regularly for a number of successive years at Elsenburg, that the introduction

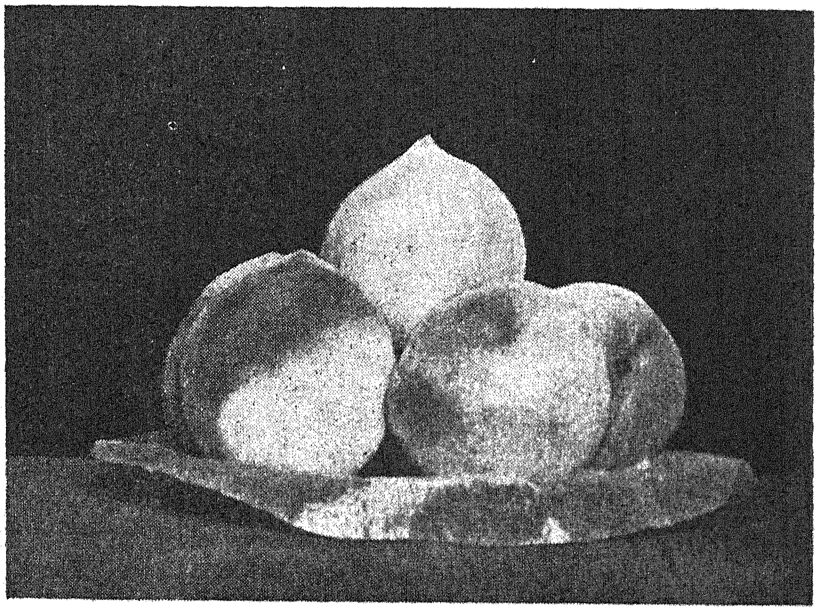

FIG. 3.—A dish of "Boland" peaches.

of this fruit as a new variety under the name of "Boland", is considered justifiable. Mr. T. Micklem topworked two old peach trees on the experimental farm of the Western Province Fruit Research Institute in the Drakenstein Valley to this type and there it cropped well too.

The fruit ripens just prior to the Peregrine, develops to a reasonable size and is oblong and slightly pointed in shape (Fig. II). The ripe fruit is of a whitish colour with an attractive striped red cheek and point (Fig. III). Similar to most early peach varieties the flesh does not part quite freely from the stone, but the texture is unlike that of a clingstone. The fruit is juicy and has a fine flavour.

Storage tests carried out at this Institute showed that the keeping quality of the "Boland" compares favourably with that of Peregrine. During the past season some of this fruit was railed to Mr. Stanton, Representative of the Deciduous Fruit Board in Johannesburg, on account of his interest and co-operation in this matter, and according to his reports, the fruit arrived and kept well and has favourably impressed interested parties to whom he showed the fruit.

The correct stage for picking "Boland" for Union markets appears to be when the greenish tinge has about disappeared from the skin of the fruit.

[Continued on page 390.

Rotenone and Its Use in Insecticides.

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FOR many centuries the natives of Malaya, New Guinea, the northern territories of South America and tropical Africa have utilised the ground-up roots of certain leguminous plants to poison fish. Some of the methods employed were ingenious and some very curious. In one country the poisoning of fish was made the occasion for enjoyment and excitement. Canoes, containing water and several basketfuls of chopped roots, were manned and taken into the stream or pool to be fished. The crews trampled the roots in the water until a grayish-white fluid was produced, and at a signal the liquid contents of the canoes were baled out into the stream and, after a short time, stupified fish came to the surface and were caught. In parts of New Guinea fisherman, having located lurking fish in rock pools amongst the reef, chew a little of the root, dive to the pools and squirt the contents of their mouths towards the fish. Here, again, after a few minutes the fish become stupified and can easily be captured by the natives diving again to the pools.

Although the poisonous nature of these plants has been known for centuries, it is only within comparatively recent times that the active principles have been isolated and investigated.

The Source of Rotenone.

The term rotenone was first applied in 1902 to a crystalline principle obtained from the Japanese plant *Derris chinensis* which is known as "rohten". The principal genus of plants from which, until recently, rotenone has been obtained is *Derris*. *Derris elliptica* was cultivated in British Malaya and the Dutch East Indies which were the chief areas supplying the root. This genus belongs to the Lonchocarpinae, or group of leguminous plants, which for the most part are woody climbing vines. It is a group of plants which flourishes in the tropics, being most common in South-Eastern Asia and the East Indies.

The South American sources of rotenone and related compounds are chiefly the *cubé* of Peru and the *timbo* of the Amazon basin in Brazil. These are the roots of plants of the genus *Lonchocarpus*. There are, too, other plants which supply rotenone, e.g., the genus *tephrosia*, some species of which occur in Africa.

Insecticides.

In the general search for insecticides to replace the arsenicals which have certain undesirable properties, a tremendous amount of attention has been devoted to chemicals obtained from plants. For example, the well known fly and mosquito sprays containing the active principle pyrethrin are products of pyrethrum flowers, a species of chrysanthemum. At the present time there is a world shortage of pyrethrum and all available stocks are being reserved for specific purposes for military departments.

There is also a shortage of the supply of rotenone-bearing roots. The erstwhile principal supply centres of Malaya and the Dutch East Indies have been cut off by the loss of these countries to Japan. However, as a result of a greater production of *cubé* and *timbo* roots in Peru and Brazil, the present outlook for rotenone is slightly better, but it will be some time before the supply of these roots is great enough to provide sufficient material to meet the demands of agriculture.

Some small-scale experiments have been under way in the sub-tropical parts of the Union on the growing of *Derris elliptica*, but, as yet, it is premature to say anything about them.

Rotenone and its allied compounds have been used in the preparation of a large variety of very efficient insecticides. Some years ago a highly successful compound, derrisol, was found to be very efficient as a top-dressing material for maize-stalk borer, and it was used extensively and very successfully especially in Natal and parts of the High Veld. This compound, as its name implies, contains the active principles of derries suitably emulsified for easy dilution in water. Rotenone, a crystalline substance, is practically insoluble in water, so that it has to be dissolved in a suitable solvent and then mixed with other chemicals to render it applicable as a water spray to foliage.

There are numerous proprietary products in the form of insecticidal dusts and sprays which contain rotenone or a combination of this and other chemicals. Certain flea powders for use on dogs and cats, for example, were in great demand. Some of them contained the ground roots of *derris*, *cubé*, etc., others rotenone and others extractive substances which were mixed with carriers like talc or similar inert dusts.

A very advantageous property of rotenone in insecticides, is that it acts as both a contact and a stomach poison and, against many insects, its lethal action is remarkable. In some of the early work done with this compound it was found that a solution, at a concentration of one-fifteenth of that at which nicotine is effective, was toxic to bean aphids. Nicotine is, of course, a well known insecticide which, at weak concentrations, is particularly effective against several species of aphids. Again, in comparative tests with other stomach poisons using large silkworms as indicators, it has been shown that the old established insecticide acid-lead arsenate had to be used at 30 times the dosage of rotenone to produce the same mortality. In other words, in this particular experiment, rotenone is 30 times as toxic as lead arsenate.

Physiological Action.

The physiological action of the active principles of rotenone-containing extracts on insects is not fully known, but it is generally accepted that the lethal effect is due to a paralytic action of the nervous system, particularly the respiratory centres. The paralytic action is slower than is the case with the active principles of pyrethrum, but the narcotic effect increases as time goes on, so that the speed of paralysis should not be taken as a criterion of the toxicity of these insecticides.

The effect of rotenone compounds on higher animals has been studied fairly extensivley and, while it has been demonstrated that rotenone, if swallowed, can be lethal, the dose required must be high. It appears to be more toxic to mammals if administered intravenously. Although these compounds may be slightly toxic to man, they are not sufficiently so to be dangerous in the quantities likely to be consumed.

Uses of Rotenone.

On vegetation rotenone-containing insecticides can be used as dusts, emulsions in water and aqueous suspensions of ground root. They can not be used as fumigants. The active principles of rotenonoid preparations are absorbed by the body fluids and are fatal to insects because of their effect on the nervous system.

 [Continued on page 394

Success in Beef Production.

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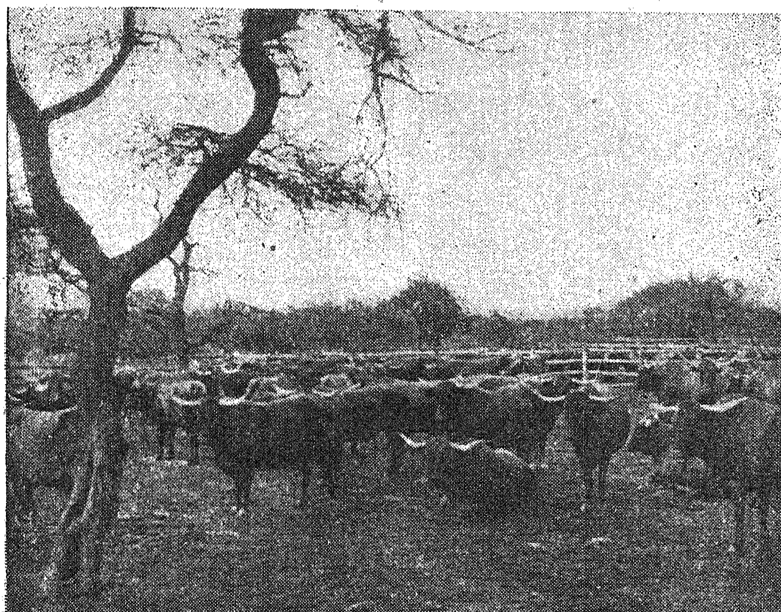
Stellenbosch-Elsenburg College of Agriculture.

FOR economic and natural reasons, certain areas are better adapted than others to the raising of beef cattle. The function of this type of farming is primarily the production of beef, this being the most important branch of farming enterprise, and, consequently, also the principal, and very often the only, source of income.



Afrikander Cattle, Messina Experiment Station.

Of the large number of slaughter-cattle slaughtered annually at the principal municipal abattoirs in the Union, the majority undoubtedly come from farms which cannot be described as purely beef-cattle undertakings. Even in areas which are eminently suited to this type of farming there are not many farming undertakings which are devoted exclusively to the production of beef-cattle, since in many cases the farms are so small that they cannot maintain a sufficient number of cattle for the farmer to derive an adequate income from the sale of cattle alone. Such farmers supplement their income by the production of cream, butter, cereals, etc.

In different parts of the country the practices followed by cattle farmers vary considerably. Every cattle farmer, however, aims at making the management and organization of his undertaking as perfect as possible with financial success as the ultimate object.

Conditions for Success.

No hard and fast rules can be laid down for success in cattle farming, but production and the management of the enterprise must be adapted to the particular circumstances in which each cattle farmer finds himself. Slight differences among individual ranches are sometimes responsible for the difference between success and failure.

Many farmers who are struggling to make ends meet, can place their undertaking on a sound footing within a reasonable period by effecting comparatively insignificant changes here and there. Certain factors in the organization and management of a cattle farm have a direct bearing on the annual income, and may be regarded as criteria of efficiency. Although it is often difficult to surmount the factors which exercise a hampering effect on cattle-farming, success can only be achieved if their restrictive influence is minimized.

Generally speaking, undertakings which are suitable for beef-production can be effectively improved and the whole industry placed on a sounder footing by due consideration of one or more of the following:—

Capital.—The *per capita* capital investment in cattle farming is greater than in any other branch of agriculture. The farmer must ensure that this capital consists of a balanced investment in land, livestock and improvements. Apart from land, the farmer's capital must be invested particularly in cattle, and not in unproductive improvements and equipment. There are farmers who are seriously handicapped by a heavy burden of unproductive capital, because the amount invested in cattle is disproportionately small.

Stock losses(1).—The prevention and control of stock diseases is an important problem for the cattle-farmer. Indeed, it is of paramount importance if he is to succeed in restricting the percentage of losses to the absolute minimum. If the necessary precautions are taken and proper use is made of the various remedies at his disposal, the farmer can, under ordinary circumstances, greatly reduce losses resulting from diseases, drought, poisonous plants, etc. Particular care must be taken in the case of young calves, where the percentage mortality is often high.

Veld.—The general care and maintenance of the animals is another important factor. In South Africa the profitability of cattle-farming has always been, and will undoubtedly long continue to be almost exclusively dependent on grazing. Natural grazing is the most economical source of feed for stock, and must, therefore, be used judiciously. The problem is to determine the carrying capacity of a cattle-farm, and then to obtain from it the highest possible production. Too many animals for a given undertaking result in over-grazing and all its attendant evils. Since they are the persons primarily affected, cattle farmers must pay greater attention to the technique of grazing and veld conservation.

Unless provision can be made for feed, the number of animals kept should not be greater than the veld is capable of maintaining during a poor year.

An adequate supply of good, readily accessible drinking-water is another important requirement for successful cattle farming.

Bonemeal and Salt.—All animals require minerals for normal growth and health. Since most of our natural pastures are deficient in certain minerals especially during certain times of the year, it is essential to feed considerable quantities of bonemeal and salt to cattle. Any expenditure on these items will be amply rewarded by the greater resistance of the animals to disease and drought, more rapid growth in young cattle, better condition in full-grown cattle, increased milk-production in cows, etc.

(1) Consult the Department of Veterinary Services, Onderstepoort, Pretoria.

Breeding[1].—It is a general complaint that a fairly inferior type of animal is kept on most cattle-farms. The use of good bulls, selection according to a definite plan, and cross-breeding will undoubtedly produce surprising results in many cases. It will pay the farmer over and over again to use good bulls, even if they are expensive.

Larger calf crop.—One of the most important things the cattle-farmer must aim at, is to obtain the highest possible number of calves from his breeding stock—70 per cent. and over. There are many factors which influence the size of the calf crop. The first requirement for a good calf crop is a sufficient number of good, well-cared for bulls which are suitable for breeding purposes. If there are too few bulls, the calf crop will be small. There ought to be one good vigorous bull for every 25 breeding cows, especially in the case of large herds. A higher percentage of calves means greater returns, and it is those few extra calves which sometimes make all the difference between success and a struggle to make ends meet. Furthermore all the bulls should not remain with the cows continuously; some must be kept in reserve, so that the run-down bulls can be replaced by fresh ones from time to time.

The poorer type of cow, bad breeders, cows which are too old, etc., adversely affect the size of the calf crop; such cows must be eliminated at regular intervals.

In order to reduce the comparatively high losses in calves and also in cows, special provision should be made for adequate grazing (and even feed) for cows which must calve towards the end of winter and in early spring when the natural grazing is poor in most areas.

Marketing.

As in any other undertaking, the cattle farmer must receive a certain return for his product, in order to cover his production costs and still retain a reasonable profit. His problem is to dispose of a maximum weight of meat for a given herd, at a minimum cost. The lower the costs and higher the value of his animals, the greater will be his profit.

He must, therefore, not only be able to produce effectively, but must also be able to dispose of his animals at their full market value. If the farmer has the correct type of beef animal there is a certain optimum age and weight at which the animals will realize the most remunerative prices; if he sells them sooner or later he will not make the maximum profit which can be obtained from them.

Animals offered for sale must be grouped into uniform classes according to sex, size, age and condition, because the average price for the group will be adversely affected by the smallest or weakest in the group.

To-day salesmanship plays a very important part in cattle-farming. The supply of and demand for slaughter cattle, available grazing, credit and various other considerations are all factors determining the attitude which the farmer can adopt towards the agent or dealer. The cattle-farmer must be well-informed in regard to the above matters when he sells, and he must be alert, because if he does bad business he may easily forfeit the profit to which he is entitled after a few years of work, risk and expense.

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(1) Various valuable pamphlets and articles on this subject may be obtained from the Department of Agriculture and Forestry.

Water-poisoning of Live-stock.

Dr. Douw G. Steyn, Onderstepoort.

THE effluents from mines and factories sometimes contain toxic substances, such as arsenic, lead, zinc, sulphuric acid, hydrochloric acid, iron, copper, prussic acid, etc. This article, however, deals only with subterranean water (wells and boreholes) containing various salts in toxic proportions. I may mention, incidentally, that if large quantities of very cold water are drunk serious symptoms of disease, such as hoven, loss of appetite, blood in the urine and even fatal haemorrhage in the lungs and brain may be caused.

Salts in Water.

We discriminate between: (1) fresh or soft waters and (2) hard, brackish, saline or alkaline waters. Fresh or soft waters contain small qantities of salts in solution while those under (2) are characterized by high percentages of the salts of calcium, magnesium, sodium and potassium. These salts are usually present in the water in the form of carbonates, bicarbonates, sulphates, sulphides, chlorides and nitrates, their presence being due to the percolation of the water through layers of soil containing the salts.

Saline waters are commonuly found in the drier parts of the country, such as the north-western Cape Province and the western and southern parts of South West Africa. In these areas, as also in other parts of South Africa, subterranean water sometimes contains harmful quantities of fluorine. The salinity of subterranean water varies considerably in the course of a year since it depends largely on the amount of rain that falls. Usually the salinity is lower during a wet year than during a dry one, although it may change suddenly without any apparent reason.

It is at the moment impossible to state definitely what the maximum degree of salinity is that can be allowed for drinking water, as the harmful effects of saline water are not dependent solely upon the degree of salinity but to a large extent upon the nature of the salts present in the water. Experiments are at present being conducted at Onderstepoort with a view to ascertaining what degree of salinity can be allowed in drinking water without detriment to health.

Susceptibility of Various Types of Live-stock.

Pigs, fowls and horses are more susceptible to the effects of saline water than cattle and sheep, while human beings are more susceptible than animals. Human beings and animals, when compelled to drink saline water, usually become accustomed to it after a while, that is, provided the salinity is not too high. On the other hand, saline water is apt to cause diarrhoea and excessive urination. Consequently, such human beings and animals would consume larger quantities of the saline water than they would of ordinary water.

Sometimes months or even years may elapse before the harmful effects, resulting from the consumption of water of a high salinity, become apparent.

Symptoms of Water-poisoning.

Some types of saline water are so poisonous that animals may die within an hour or two after drinking. This is especially the case with water containing a high percentage of saltpetre (nitrates) and ordinary salt. In some cases symptoms of spasm and convulsions

occur, but usually one of the first symptoms is diarrhoea coupled with a gradual loss of condition.

The following symptoms are commonly observed in cases of slow poisoning by saline water: vomiting (in dogs, cats and pigs); hoven; loss of appetite; chronic diarrhoea; excessive urination; increased thirst; poor development in young animals and poor condition (in spite of good grazing) in full-grown animals; general debility; anaemia; reduced yield of milk, wol, etc.; impaired reproductive powers; increased susceptibility to internal parasites as also to the harmful effects of drought. Owing to the soiled tail and back part of the sheep with wet faeces, the blow-fly problem is very much aggrevated. Water containing a high percentage of lime, magnesium and sulphates is apt to disturb the processes of mineral metabolism in the body. Hence, animals which continuously drink such water show a greater tendency to eat foreign matter, such as bones, tins and rags, and to contract "stywesiekte" and "lamsiekte", than do animals that drink fresh water. Such water is also one of the causes of decay of teeth. *Continuous drinking of water of a high salinity, and/or excessive hardness, is one of the important causes of bladder and kidney stones.* See Reprint on Kidney and Bladder Stones.)

Water containing a high percentage of fluorine is the cause of mottled (white, brown and yellow blotches) and bad teeth, and should the fluorine content be abnormally high, the animal's bone-system may also be affected. In such cases lumps develop on the bones, while the animals suffer from a stiff back.

Post-mortem Lesions.

When the animal dies suddenly, as may happen when the water contains a high percentage of saltpetre, typical lesions may be entirely absent. Usually, however, the animals are in poor condition and show signs of more or less acute inflammation of the stomach and intestines; especially the small intestine. This inflammation often becomes chronic. Anaemia and bladder and kidney stones may also be present.

Treatment.

It is essential that the drinking of saline water should be stopped forthwith and that the animals be given fresh water. Usually treatment is not necessary since affected animals recover rapidly after having changed to fresh water. In cases of acute diarrhoea, carron oil (a mixture of equal parts of raw linseed oil and lime water) could be given twice daily, i.e., a cupful per animal in the case of sheep and a pint in that of cattle. The mixture acts better when two tablespoonfuls of tannic acid are added per pint. (For further treatment of cases of poisoning see Reprint No. 70, 1941.)

Precautionary Measures.

Samples of drinking water for stock may be forwarded for analysis to the Director of Veterinary Services, Onderstepoort. It should be stated whether the sample was taken from a well, borehole or dam. In the case of dam water care should be taken to have the sample free from mud. When taking a sample from a borehole which has not been in use for a long time, the water in the hole should first be pumped out thoroughly so as to eliminate the possibility of the water containing a large amount of rust from the iron pipes. It is claimed that the water from some boreholes is improved by pumping for a considerable time before using the

water. In such cases a sample should be taken before and after pumping. In cases of suspected water-poisoning, it is essential that the symptoms of disease and post-mortem lesions should be accurately described. It should also be stated whether the water is clear when drawn from the borehole, well or dam, and whether the animals (cattle, horses, goats and sheep) drinking the saline water show a tendency to eat bones, tins, rags, etc., and whether " stywesiekte " and " lamsiekte " occur frequently on the farms concerned. Information as to the nature and quality of the grazing, i.e., whether it consists of karroo-veld, grassveld, " broken " veld, etc., is also very important. To enable a complete analysis to be made, two quart bottles of water are required. The bottles should be thoroughly cleaned before filling them with the samples. The charge for analysis is two shillings per sample. Where irrigation and household water is to be analysed samples should be forwarded to the Chief, Division of Chemical Services, Belvedere Street, Pretoria.

So far as drinking water for human beings is concerned, the requirements could best be met by catching and storing as much rain water as possible in tanks.

In the case of livestock, the saline water problem could be partially or even completely solved by (*a*) catching and storing rain water in dams and using the latter as drinking places. Animals and human beings can usually stand brackish water fairly well for short periods, but invariably suffer when they have to drink it continuously; (*b*) by sinking several wells or boreholes as it often happens that good water is found in the vicinity of other wells or boreholes in which the water is so strongly saline as to be undrinkable. If possible stock should not be allowed to drink highly saline waters for longer than one to two weeks. After such a period they should have access to soft water for the same period.

Removal of Salts from Highly Mineralized Waters.

The cost of removing salts from highly mineralized waters is prohibitive. However, there are parts of our country, e.g., southern and western Transvaal, where the water is only slightly mineralized, but contains dangerous quantities of fluorine. This type of water can be made potable by removal of the fluorine. (See Reprint No. 66, 1940.)

Warning.—It is essential to submit specimens from time to time of the water after having applied the method (as described in Reprint No. 66) for removal of the fluorine in order to ascertain whether the water is wholesome.

The New Dessert Peach "Boland":—

[*Continued from page* 382.

These particulars about this new variety of peach are brought to the notice of the public, since its performance is considered to justify its introduction and trial commercially, especially in the lower-lying areas of the western Cape Province, such as Somerset West, Stellenbosch and the Drakenstein Valley.

Budwood (at 1d. per bud, payable in advance) is very limited, and farmers and nurserymen anxious to obtain supplies are advised to apply to the Director, Western Province Fruit Research Institute, Stellenbosch.

Kromnek Disease of Tobacco.

A Promising Method of Control.

Dr. J. E. van der Plank (Division of Botany and Plant Pathology) and E. E. Anderssen (Division of Entomology).

KROMNEK disease is the most damaging disease of tobacco in many areas of the Transvaal, and appears with great regularity year after year in the Brits district and others. It is specially troublesome among young plants soon after transplanting, although it can also attack plants which are mature; and it is usually, but not invariably, found to a greater extent early in the season than in crops which are planted later in summer.

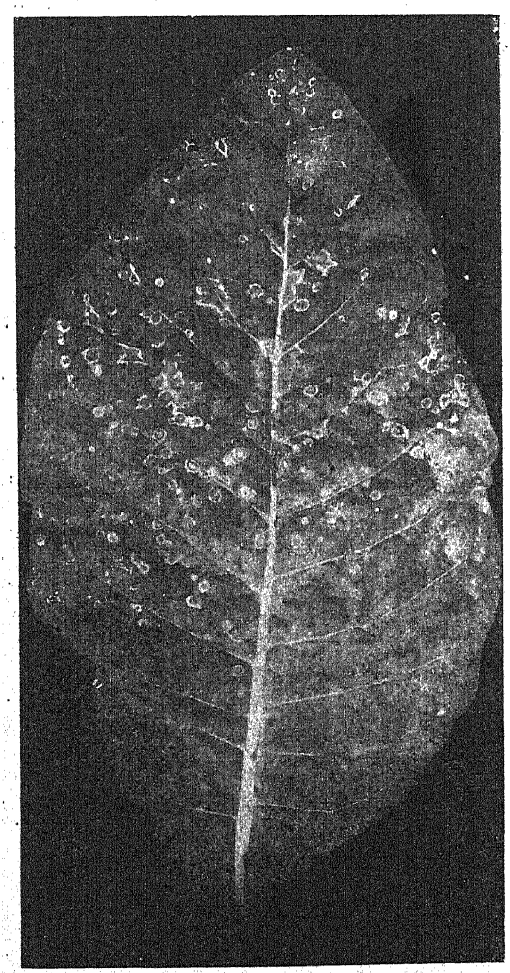


FIG. 1.—Ringspot markings on a tobacco leaf.

Infected plants are practically worthless. Growth is stunted, and the leaves show typical markings of a fern-leaf, network or ringspot pattern (Figures 1 and 2). With light-leaved types of tobacco the economic losses from the disease are doubly severe; not only is the stand reduced, but, as a consequence of the poor stand, the remaining plants grow too vigorously and yield coarse, inferior leaves.

Hitherto there has been no means of controlling kromnek, but in the past two years we have tried out a method of close planting which has given excellent results. Most of the tests have been in the Brits area, with a few in the Rustenburg district, but we have every hope that growers in other parts of the country will find the method of value to them as well.

Some Facts about Kromnek.

Before describing the method, let us give a few facts about kromnek which explain the system of close planting:—

Kromnek is a disease of living plants only. It does not survive in dead plants, old leaves, dry stubble, or soil, so there is no chance of infecting plants from the dead remains of a previous crop on the

same land. Nor is infection carried by the seed; every new crop of tobacco must get its infection from other living plants which are diseased. Unfortunately, this is not such an advantage as it might seem on first thoughts, because the variety of living plants which can carry the disease is almost unlimited. Kromnek attacks a wide range of garden plants like zinnias and dahlias, vegetable crops like tomatoes, and weeds and veld plants like stinkblaar, (*Datura*), black-jacks and Cape gooseberries. From almost anywhere in the veld, from neighbouring gardens, from vegetable crops, or from old lands, tobacco fields may receive infection.

Kromnek disease is carried by small insects called thrips, which after picking up infection from a diseased plant, spread it about as they move around. Here we come to the peculiar point about tobacco. On most crops subject to kromnek, the species of thrips that carry the disease can breed and multiply freely, but this is not the case with tobacco. They do not thrive on this host, and except in one or two rare instances have not been found breeding on the leaves; on the contrary, a large proportion of those which have settled on leaves are found on subsequent examination to have died. Those that survive do not move about much (it is possible that the sticky leaf-hairs hinder movement) and the evidence collected in the field over three years is conclusive that with tobacco there is no carrying of infection from plants to their neighbours.

Close-planting.

This is the clue to the control of kromnek on tobacco: the insect which carries the disease is more or less immobile on tobacco and cannot spread the disease from plant to plant. Infection of tobacco, it seems, almost invariably comes from some plant other than tobacco. It is carried into the field from without; it does not build up from within.

The number of infective insects which arrive in a field is not unlimited, and one can save a good stand of plants by transplanting more than would be needed if all remained healthy. The excess plants are spares, which act as host to the infective insects which come into the field and in this way safeguard the rest. Doubling the number of plants set out in a field has, in the experiments at Brits, always allowed a good stand of healthy plants to remain; and when bad outbreaks have occurred, double numbers have saved the crop, while fields planted out in the normal way have been fit only for ploughing under.

After transplanting thickly, the plants can be left for four to eight weeks, according to the rate of growth they have made. Then, if there is overcrowding, the stand can be reduced to proper limits by pulling up any excess of plants. From this it will be seen that the method is at its best during the month or two immediately after transplanting, when the plants are small and can be set out in great numbers. It is during this period following transplanting that the greatest danger of kromnek exists, and even if protection were given only then the method would go far towards solving the kromnek problem.

When a plant has grown to maturity one cannot reasonably speak of it as a spare. Its loss is a real loss, because it cannot be made good by the continued growth of a neighbour. Nevertheless, even when plants are large, close planting is of great value against

kromnek. It reduces the percentage of plants which are likely to become infected, because it increases the number of plants over which any infective insects which invade the field are spread. The best rule for taking the sting out of kromnek is to maintain as many plants as possible per morgen at all stages of growth. The number that a field can carry as the plants become large depends on the soil, the amount of water, the variety of tobacco and the type of leaf produced, and so on. One cannot generalise, but it is believed that, in the Brits area at any rate, most growers could increase the stand of plants with benefit both to the quantity and the quality of leaf, besides minimising the risk of kromnek. Indeed, the poor, broken stands which are often seen in that area must be regarded as one of the reasons which contribute to the heavy losses which follow outbreaks of kromnek.

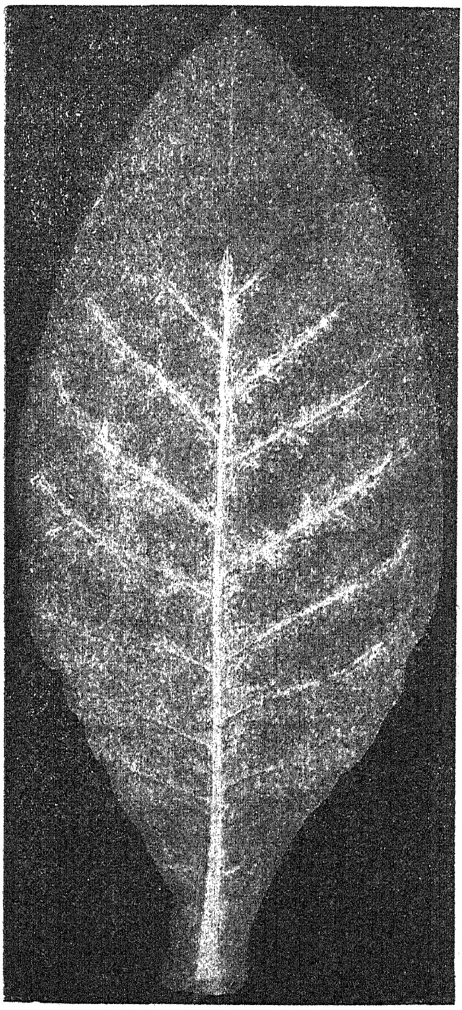


FIG. 2.—Fern-leaf markings on a tobacco leaf.

Planting in Pairs.

One can double the stand of plants either by halving the distance between them or by planting in pairs, with the same distance betwene pair and pair as normally exists between plant and plant. Planting in pairs has this advantage: when it comes to thinning out any excess of plants, one of the pair can be left and an even spacing between plants maintained. It is only when both plants of the pair become infected that a gap in the row results. Infection of both plants is rare—so rare as ordinarily to be of little practical consequence. This is seen clearly from the figures in Table 1, which summarises results from the Brits area during the past two seasons. Ten comparisons were made. In each case part of the field was planted in the ordinary way, and part with the plants in pairs, keeping the distance between pair and pair the same as between plant and plant in the other part. The table gives the percentage of pairs which were last by *both* plants becoming infected, the record being taken from one or two months after transplanting, when surviving plants were tall and growing vigorously.

TABLE 1.—*Losses from Kromnek: A comparison of the ordinary method of planting, with planting in pairs.*

Variety.	Ordinary method: Per cent. plants lost.	Planted in pairs: Per cent. pairs lost.
Amarelo	2·0	0
Piet Retief Swazi	3·2	0·6
Amarelo	4·4	0
W. D. Nyassa	4·7	0·5
Waterberg Selection	9·9	1·0
Amarelo	12·0	2·6
Groot Swazi	12·7	1·0
Piet Retief Swazi	17·6	1·2
Amarelo	19·7	1·7
Amarelo	26·1	2·9
AVERAGE	11·2	1·15

The table shows that on an everage the losses were reduced to about a tenth by planting in pairs. In the worst case, the percentage of pairs lost was only 2·9, which is practically negligible, whereas 26·1 per cent. of the plants were infected when the field was planted in the ordinary way.

Summary.

From experiments in the Brits area it is recommended that kromnek be combated by close planting. Fields should be planted as thickly as possible at all stages of growth. For a month or two after transplanting, when the danger of kromnek is specially great, an excess of plants is particularly desirable; if necessary they can be thinned out later when overcrowding begins.

Setting the plants out in pairs during transplanting is a convenient method of increasing the stand.

Rotenone and Its Use in Insectecides:—

[*Continued from page 384.*

These compounds may be used alone or in combination with other insecticides, e.g., they may be incorporated with nicotine, arsenic or the aliphatic thiocyanates. In combination with pyrethrum, rotenone makes a highly efficient remedy for ticks and fleas on dogs.

Rotenone dusts, washes, etc., may be applied to vegetation without fear of damage. An application of a spray containing 0·02 per cent. rotenone, is said to be very toxic to the larvae of *plutella* (the Cabbage Caterpilla) on cruciferous plants.

As a substitute for arsenic in sprays against codling moth, rotenone, at low concentrations, has given encouraging results. As a toxicant added to oil sprays for use against scale insects, it has given good results. In fact, it would appear from the voluminous literature on the subject that rotenoid insecticides are likely to become even more important and enjoy greater uses than they already possess.

Influence of Milk Yield on the Growth of Lambs.

F. N. Bonsma, Professor in Animal Breeding, Agricultural Research Institute, Pretoria.

IN the production of fat-lambs, their rate of growth is of fundamental economic importance. In fact, the success of the undertaking is dependent upon the ability of the lambs to grow sufficiently rapidly so as to combine the production of fat simultaneously with bone and muscle development. Young lambs begin to nibble grass and other feedingstuffs when about two to three weeks old, but the amount of food they can consume other than milk is at first very small. Scarcity of milk during the early stages of a young lamb's life encourages it to use other feedingstuffs. Since its digestive system is still undeveloped at this stage it is not capable of digesting bulky feedstuffs. The development of the lamb is therefore retarded, resulting in a small pot-bellied animal.

> In a previous article, which appeared in the May issue of *Farming in South Africa*, the writer dealt with the comparative milk yields of purebred Merino and Blackhead Persian ewes and those of different crossbred ewes produced by crossing these two breeds with various mutton rams.
>
> The present article deals with the relation between the milk production of ewes and the growth of their lambs.

Growth in relation to Milk intake.

In order to ascertain the influence exerted by the milk-yield of ewes on the growth of lambs, a comparison between the weight-growth of lambs and the milk yield of the corresponding dams has been studied for the suckling period.

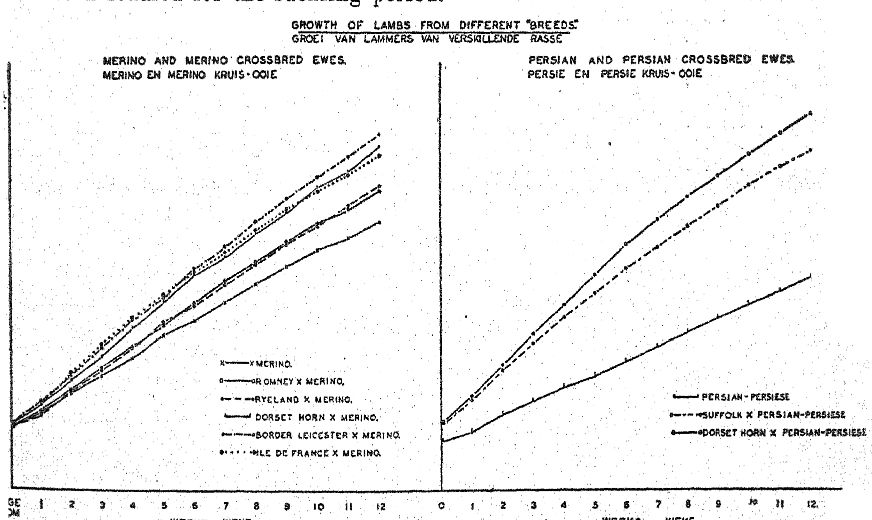


FIG. IV.

The average weekly body-weights of lambs from different groups of ewes for which milk yields have been recorded are tabulated in Table IV and are graphically shown in Figure IV.

It will be seen that the relative level of the growth curves closely follow those obtained for the corresponding milk yield for the different " breeds ". (See Figure I, *Farming in South Africa*, May, 1944, page 317.) The average total milk yields, as calculated before, and corresponding gains in live-weight for the first 12 weeks following birth are indicated in Table V.

TABLE IV.—*Average Body-weights of Lambs from Different Groups, in lb.*

Breed.	Weeks.						
	Birth weight.	1.	2.	3.	4.	5.	6.
M.	8·63	10·76	13·56	16·00	18·64	21·86	23·94
Ro.	8·40	10·87	14·34	17·31	20·16	23·28	26·14
Ry.	8·26	10·38	13·95	17·16	20·30	23·34	26·08
D.H.	8·92	12·09	15·59	18·78	22·86	26·51	30·43
B.L.	9·45	12·10	16·08	20·02	24·34	27·34	30·82
F.O.	8·62	12·08	16·43	20·44	24·08	27·20	30·47
P.	6·88	8·29	10·61	12·50	14·42	16·07	18·04
P.F.	9·28	12·71	16·78	20·69	24·42	27·63	31·16
P.H.	9·67	13·34	17·57	22·02	26·14	30·44	34·41

Breed.	Weeks.						
	Birth weight.	7.	8.	9.	10.	11.	12.
M.	8·63	26·52	29·03	31·51	33·94	35·51	37·82
Ro.	8·40	29·45	32·28	34·92	37·54	39·62	42·37
Ry.	8·26	28·89	31·84	34·84	37·13	40·01	42·73
D.H.	8·92	32·94	36·26	39·22	42·62	44·89	48·44
B.L.	9·45	34·20	37·88	44·03	44·11	47·20	50·27
F.O.	8·62	33·49	36·46	39·44	42·27	44·50	47·22
P.	6·88	20·12	22·30	24·05	26·09	27·87	29·83
P.F.	9·28	34·14	37·09	39·84	42·70	45·44	47·68
P.H.	9·67	37·96	41·25	44·37	47·26	50·12	52·71

All the lambs from the Merino and Blackhead Persian ewes were first-cross lambs, whilst those from the crossbred ewes were all Southdown topcross lambs. These results clearly indicate the association between the level of milkproduction and the weight increase of the lambs.

Statistically no significant differences could be established between the milk yields of the Border Leicester, Dorset-horn and Ile de France-Merino crossbred ewes, and this is borne out by the corresponding growth of the lambs reared by these three groups of ewes. The growth curves of the progeny from the Romney-Marsh and Ryeland-Merino crossbred ewes again reflect the lower level of their milk production as compared with the yields of the first-mentioned breeds.

TABEL V.

Breed.	Average Milk yield in oz.	Average Gain in Body-weight of Lambs in lb.
M.	2039	29·19
Ro.	2890	33·97
Ry.	3075	34·46
D.H.	3301	39·52
B.L.	3458	40·82
F.O.	3538	38·60
P.	1071	22·95
P.F.	2632	38·40
P.H.	3314	43·04

The influence of the differences in the average milk yields between the Blackhead Persian and Suffolk and Dorset-horn crossbred ewes is clearly shown in the average growth-curves of their lambs. (Figure IV.)

In order to study the influence of the variation in milk yields on the growth of lambs in greater detail the amount of milk consumed per pound gain in live-weight for successive three-weekly periods was calculated.

The lambs from Merino and Blackhead Persian ewes included all first cross lambs, whilst the lambs from the various groups of crossbred ewes were all second-cross Southdown lambs.

The results are shown in Table VI.

TABLE VI.—*Milk Consumed.*

Breed.	1st Period 0–3 weeks.	2nd Period 3–6 weeks.	3rd Period 6–9 weeks.	4th Period 9–12 weeks.
	oz.	oz.	oz.	oz.
1st Cross Merino Lambs.	104·2	76·9	69·5	61·5
S.D. × Ro lambs.......	103·0	100·1	84·5	77·9
S.D. × Ry lambs.......	110·1	105·5	90·1	85·7
S.D. × D.H...........	104·8	87·0	93·9	74·2
S.D. × 1 h lambs.......	105·0	97·3	82·0	70·6
S.D. × Fo lambs.......	98·5	106·9	97·5	90·0
1st Cross Persi n Lambs.	80·1	57·1	38·8	29·5
S.D. × P.F. lambs......	85·2	87·5	78·9	74·6
S.D. × P.H. lambs.....	87·5	87·7	86·4	75·4

The decrease in the amount of milk consumed per pound gain in live-weight during the successive 3-weekly periods is significant ($P < \cdot 01$), an appreciable decrease being observed as the lambs get older.

The decrease in milk intake is, no doubt, due to the increased utilization of other food with increase in age of the lambs. The decrease in milk intake is most marked in the case of the Merino and Blackhead-Persian first cross lambs.

During the first period there was no significant difference in the amount of milk consumed per pound increase in weight between the first cross Merino lambs and the second cross Southdown lambs from cross-bred Merino ewes.

The amount of milk consumed per unit gain in live-weight by the Merino first- and second-cross lambs was, however, significantly ($P < \cdot 01$) higher than that of first- and secondcross Persian lambs.

These results indicate that the Blackhead-Persian and its crosses are able to utilise milk more efficiently than the Merino crosses. This was particularly the case during the first three weeks.

The apparently higher efficiency of the firstcross Merino and Blackhead-Persian lambs, as compared with the second-cross Southdown lambs, is probably due to the lower level of milkproduction of their dams, resulting in a greater utilization of other foodstuffs at an earlier age.

Another contributing factor may be the fact that the second cross lambs, owing to their higher level of milk intake, were capable of combining growth with fattening qualities. Since the amount of food required for the production of one pound of body fat is considerably higher than the amount required for the production of the same amount of muscular tissue the amount of nutrients required per pound gain in live-weight will increase as the proportion of fat deposition to muscle growth increases. The higher milk intake per pound gain in live-weight may therefore be interpreted as being partially due to the fact that the lambs reared by the crossbred ewes were able to grow and deposit intra muscular fat at the same time.

The fact that no significant difference could be established in the amount of milk consumed per unit gain in live-weight during the first three weeks between the Merino first cross and second cross lambs and also between the Persian first and second cross lambs support the above explanation, since it is doubtful whether any fat deposition takes place at such an early age.

Another factor which may perhaps have some influence upon the comparative efficiency of milk utilization between first cross Merino and first cross Blackhead-Persian lambs is the difference in the nutritional requirements for wool growth between the two crosses. In the first-mentioned cross it is likely that a certain amount of the available nutritients is used for the production of wool, whereas in the latter cross, which is practically non-woolled, no nutrients will be used for the production of wool.

In the Southdown second crosses no appreciable differences can be observed in the amount of wool covering between these two types of topcross lambs. It is therefore very doubtful whether there are any differences in the relative nutritional requirements for wool production between these crosses. The production of wool, as a factor which may influence the differences in the efficiency of milk utilisation in the Southdown second cross can therefore be eliminated.

The appreciably more efficient utilization of milk intake by the second cross Blackhead-Persian lambs as compared with the second cross Merino lambs cannot be accounted for on differences in the level of milk production between the Merino and Blackhead-Persian crossbred ewes. The more efficient utilization of the milk supply of their dams by the Blackhead-Persian second cross lambs may be due to inherent metabolic differences, closely associated with the adaptability of the Blackhead-Persian to South African conditions. Should this explanation prove to be correct, it would add yet another point in favour of the use of Blackhead-Persian ewes for the production of fatlambs.

In order to analyse the influence of the level of milk production on the gains in live-weight of lambs still further, the crossbred ewes were divided according to the milk yields into the following groups.

1. Ewes producing more than 3,500 oz. of milk.
2. Ewes producing from 3,000 to 3,500 oz. of milk.
3. Ewes producing from 2,500 to 3,000 oz. of milk.
4. Ewes producing from 2,000 to 2,500 oz of milk.
5. Ewes producing from 1,500 to 2,000 oz of milk.

In view of the differences observed in the amount of milk consumed per pound gain in live-weight between the Southdown topcross lambs out of Merino crossbred ewes and Southdown topcross lambs from Blackhead-Persian crossbred ewes, these were analysed as two separate groups.

The results are tabulated in Table VII.

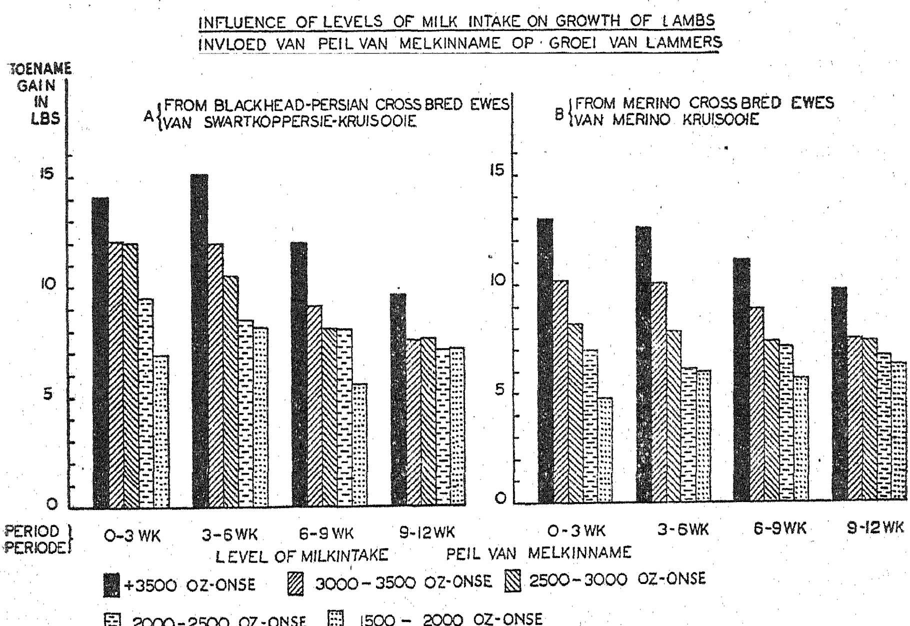


FIG. V.

The results shown in Table VII are graphically represented in Figure V. The analysis of the data shows that the gains in live-weight of the second cross Southdown lambs reared by Blackhead-Persian crossbred ewes were significantly ($P < \cdot 01$) higher than those from second cross Southdown lambs reared by Merino crossbred ewes for the same level of milk intake.

TABLE VII.—*Average Gains in Live Weight.*

A.—SOUTHDOWN SECOND CROSS WITH BLACKHEAD-PERSIAN EWES.

Level of Milk intake.	Birth-weight-lb.	1st Period 0–3 weeks.	2nd Period 3–6 weeks.	3rd Period 6–9 weeks.	4th Period 9–12 weeks.	Total gain in lb.
oz.		lb.	lb.	lb.	lb.	lb.
3,500	10·95	14·19	15·13	12·04	9·75	51·08
3,000–3,500..	9·30	12·05	11·97	9·23	7·62	40·88
2,500–3,000..	9·37	12·02	10·52	8·26	7·72	38·52
2,000–2,500..	8·16	9·53	8·51	8·22	7·24	33·50
1,500–2,000..	8·27	6·81	8·39	5·55	7·26	28·01

B.—SOUTHDOWN SECOND CROSS WITH MERINO CROSSBRED EWES.

Level of Milk intake.	Birth-weight lb.	1st Period 0–3 weeks.	2nd Period 3–6 weeks.	3rd Period 6–9 weeks.	4th Period 9–12 weeks.	Total gain in lb.
oz.		lb.	lb.	lb.	lb.	lb.
3,500........	10·01	12·96	12·59	11·18	9·74	46·48
3,000–3,500..	8·40	10·27	10·07	8·80	7·59	36·73
2,500–3,000..	7·85	8·32	7·80	7·45	7·43	30·97
2,000–2,500..	7·05	6·92	6·26	7·24	6·93	27·35
1,500–2,000..	7·61	4·79	6·00	5·63	6·63	23·05

These results provide further evidence of the increased efficiency of milk utilization by second cross lambs from Blackhead-Persian crossbred ewes.

Conclusions.

The marked influence of the differences in the level of milk production of the various groups upon the gains in live-weight of the lambs clearly demonstrate the importance of the quantitative milkproduction of ewes in relation to the growth-rate of lambs. The differences in gains made by lambs reared on different levels of milk intake are most marked during the first periods, i.e. up to six weeks of age. These differences again emphasise the fact that it is mainly during the early post-natal stages when the growth of lambs is most rapid and entirely dependent upon the milk secretion of their dams that the weight growth of lambs from low-yielding ewes suffers most.

It is hardly necessary to stress the economic importance of a difference of 23 lb. gain in live-weight at 12 weeks between the highest and lowest milk-producing groups.

The results clearly emphasise the necessity for a high level of milk intake for the production of fatlambs, since it is essential that fattening should take place simultaneously with growth. It is obvious that any deficiency in the milk supply of ewes cannot be made good successfully by supplementary feeding, where a deposition of fat is required during the early stages of growth. The digestive system of young suckling lambs is not capable of coping with unlimited quantities of bulky foodstuffs, and it must be noted that the digestibility of ordinary feedingstuffs is lower than that of milk.

The results obtained lend strong support to the view expressed at an earlier stage, namely, that the main disability of the Merino and Blackhead-Persian breeds for the direct production of fat lambs is their low milk production. The advantage resulting from the superior milking qualities of the crossbred ewes for the production of sucker lambs has been proved beyond doubt.

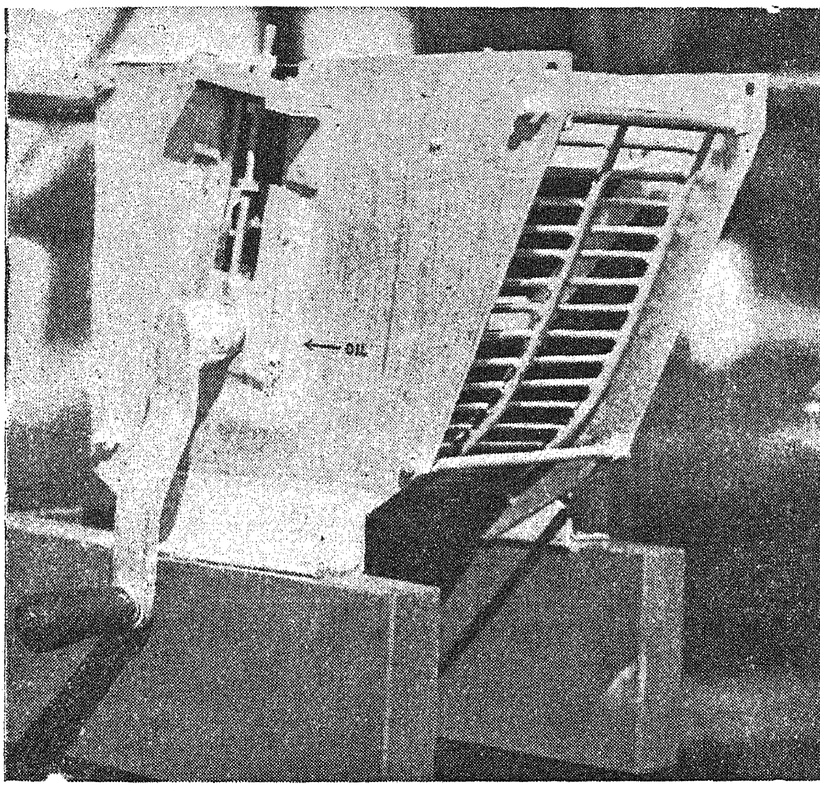
Acknowledgement.

The writer wishes to express his appreciation to the staff and students of the Department of Animal Husbandry of the University of Pretoria for their generous co-operation over the period of years during which the investigation was carried out. Without their active collaboration it would have been impossible to obtain the weekly milk records of sheep for 24-hour periods. Special mention must be made in this connection of the services rendered by Mr. A. G. Pretorius, Sheep and Wool Assistant.

A Novel Peanut Sheller.

E. A. Oosthuizen, Professional Officer, College of Agriculture, Potchefstroom.

EXPERIENCE has shown that when shelled with the ordinary four-beater drum, the amount of breakage in peanuts is excessive. The breakage is due, in the first place, to the fact that for shelling to occur, the distance between beaters and concave has to be reduced to a minimum, and, secondly, to the shock of impact of the relatively narrow beaters on the nuts.

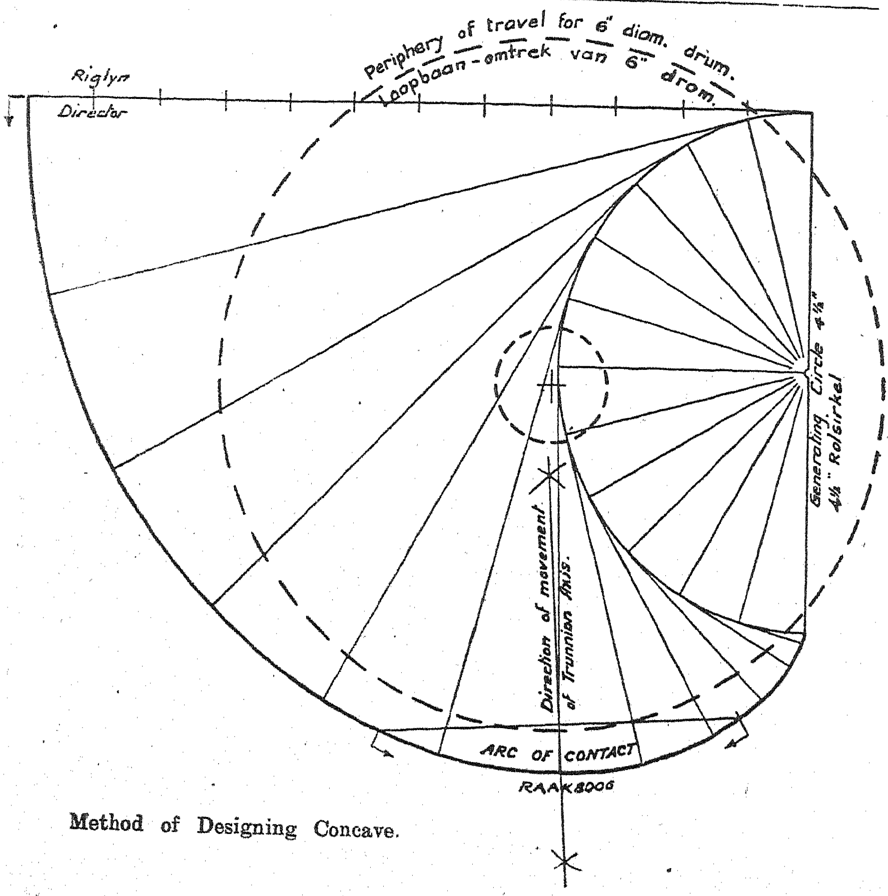


Novel Peanut Sheller.

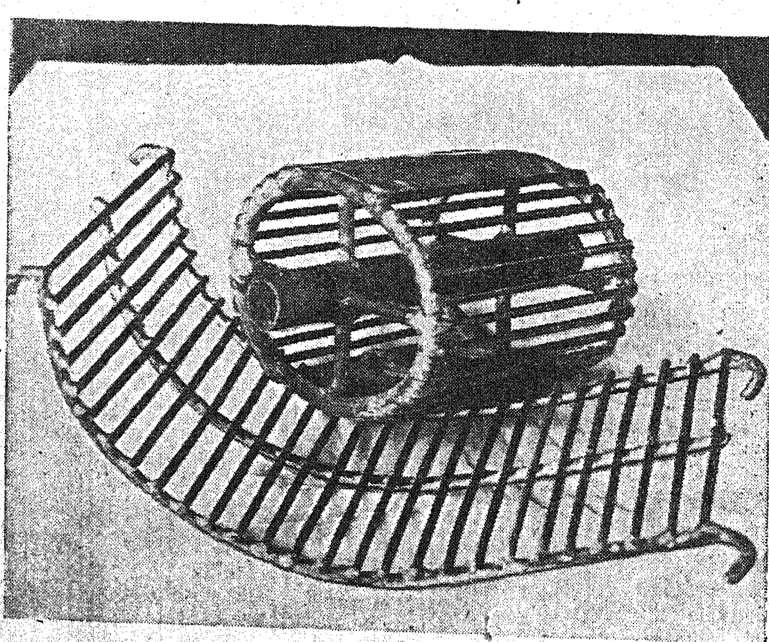
In the machine illustrated below shock is reduced to a minimum by the elimination of the beater effect, while the distance between drum and concave can be adjusted so as to avoid the excessive crushing of shelled nuts so characteristic of the beater drum. Instead, shelling takes place upon a layer of nuts and shells so that a cushioning effect is obtained.

It will be observed that the concave is in the form of an involute which, besides facilitating feeding, makes shelling gradual but imperative because of the continued narrowing of the passage to the arc of contact.

Furthermore, the drum is in the form of an ellipse so that instead of shelling by impact, the nut is subjected to a gradually increasing pressure as well as to a "rasping" action, by virtue of the eccentricity of the drum.



Method of Designing Concave.

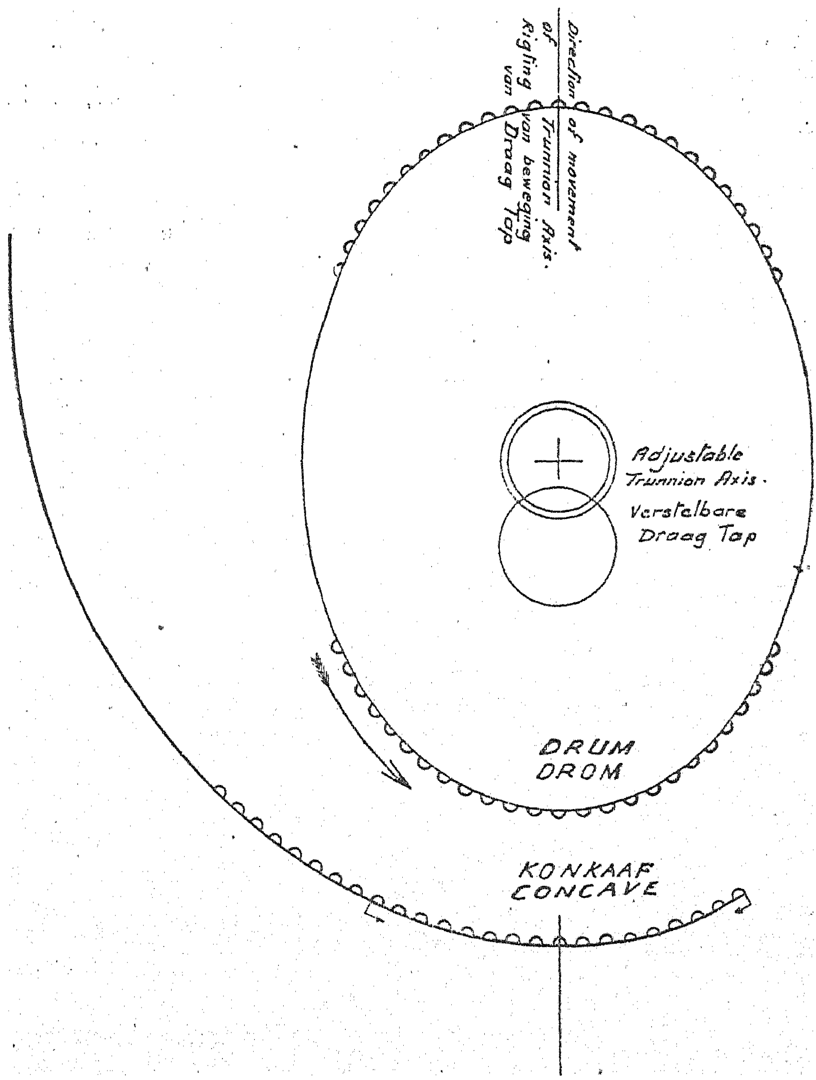


Drum and Concave.

The drum can be raised or lowered as required by adjustment of the trunnion axis.

The layer of thin rods forming the surface of the concave and the ends of the drum are spaced $^9/_{16}$ in. and $^7/_{16}$ in. centres respectively.

In the larger machines a better drum balance and an increased output can be obtained by using two ellipsi with their major axes at right angles to one another.



Normal Cross-section through Concave and Drum.

Nursery Quarantines.

The following nursery quarantines were in force on 1 May 1944:—

(1) Beaulieu Nurseries, Forestdale Siding, P.B. Grahamstown, C.P., on citrus (all), for red scale.

(2) Alexander's Nurseries, Lawrence Street, Grahamstown, C.P., on citrus (all), for red scale.

Pear Meal For Pigs.

G. W. Johnston and J. C. Swart, Department of Animal Husbandry, Stellenbosch-Elsenburg College of Agriculture.

DURING the 1943 fruit season a considerable quantity of pear meal was manufactured by the Deciduous Fruit Board. This meal was made by drying codling-moth infested and other low grade pears, unsuitable for human consumption, and grinding the dried pears into a coarse meal. A quantity of this meal was supplied gratis to the College for experimental purposes. Two experiments with this meal have been completed.

Since pear meal is a comparatively unknown feed, a brief description of it may be of interest:—

Pear meal has a very sweet and attractive smell. It is very palatable and was readily eaten. Although by the end of the experiment the pear meal must have been at least 9 months old, it retained its weet aroma and did not appear to have been attacked by any insect or fungous pests. As at present prepared, this feed gives a certain amount of extra work as it forms a sticky mass in the bags. However, when broken up and rubbed between the hands, it readily breaks up again into a meal. The analysis is as follows:—

Moisture	8·5 per cent.
Protein	2·5 per cent.
Fat	0·7 per cent.
Crude fibre	8·1 per cent.
N. free extract	78·2 per cent.
Ash	2·0 per cent.

The other feeds used were those usually used by pig farmers in the western Cape Province.

The mealie meal was yellow straight run. The rye meal was rye coarsely ground by our own hammer mill. The fish meal was of a well-known brand manufactured in Cape Town.

The acorns were picked up at Elsenburg. They were thoroughly dry when fed and were, unfortunately, bady damaged by weevils before the end of the experiment.

First Experiment.

The pigs used in this experiment were pure-bred Large Blacks and pure-bred Large Whites. The Large Blacks were born on 26 June 1943, and the Large Whites on 28 June 1943. The treatment given to both litters was as follows: The sows farrowed in sties. Both the sows and the young pigs were allowed to run out in an attached camp where a little grazing was available. When 14 days old, the sows were placed in camps sown to oats which had been grazed short by ewes with lambs. At 3 weeks of age creep feeding of the piglings commenced. At 8 weeks of age the pigs were weaned. The average weight at weaning of the 9 pigs in the Large-Black litter and the 7 pigs in the Large-White litter was in both cases 47 lb.

The pigs were weaned by being placed in the sties. Advantage was taken of this opportunity to dose the pigs for round worms with santonin and calomel. Unfortunately, at this stage the pigs received a setback owing to the feeding of new season's mealie meal which had been milled when too wet and had heated in the bags. Pear meal was not fed to the pigs prior to the commencement of the experiment, which started on 4 September 1943.

Six pigs were selected from each litter and divided into two groups. Each group consisted of three Large Blacks and three Large Whites.

The experiment may be divided into two periods. In the first period the pigs were run in the same two camps in which they had run with their mothers. As stated, these camps had been sown to oats, and while the pigs were in the sties being weaned and dosed, the camps were heavily grazed by sheep. The pigs remained 8 weeks in these camps. Owing to the high state of fertility in the camps which had been used as pig camps for some years, the oats grew luxuriantly, and six pigs were insufficient to keep the growth down. Towards the end of the eighth week the fibre content of the oats was rather high for pigs. The meal mixture for the pigs at this stage was for the first group:—

200 lb. mealie meal, 100 lb. rye meal, 30 lb. fish meal.

The second group received only 100 lb. mealie meal, the other 100 lb. of mealie meal being replaced by 100 lb. pear meal. In addition the pigs were fed ½ lb. acorns for each lb. of meal fed. The acorns were only fed once a day.

During the second period the pigs were confined in sties. They were fed the same meal mixture, except that the fish meal was reduced to 15 lb. Acorns were fed at the same rate as before. Since the white pigs were rather lighter than the Large Blacks, they were kept in separate pens, but were fed the same amount. The second period lasted for 51 days.

Results of First Experiment.

The pigs were last weighed before being fed on the morning of 20 December. They were railed to Gouda and were again weighed at 2 p.m. on the 21st. The percentage loss in weight between the two weighings was 4·6 per cent. in the case of the pear-metal group and 3·3 per cent. in the case of the first group. The dressing percentage was 78·0 per cent. in the pear-meal group and 80·4 per cent. in group without pear meal. All weights are given in lb.

TABLE I.

	GROUP 1.	GROUP 2.
	Without Pear meal.	With Pear meal.
First Period.		
Number of pigs in experiment	6	6
Duration of period in days	56	56
Average weight at beginning of experiment	55·5	56·5
Average weight at end of first period	132·8	131·2
Total increase per group	464·0	448·0
Daily increase per pig	1·38	1·33
Meal consumed per group	1030	1030
Acorns consumed per group	515	515
Meal consumed per lb. live-weight increase	2·219	2·299
Acorns consumed per lb. live-weight increase	1·109	1·149
Second Period.		
Duration of period in days	51	51
Average weight at beginning of period	132·8	131·2
Average weight at end of period	210·0	198·8
Total increase per group	463·0	406
Daily increase per pig	1·51	1·33
Meal consumed per group	1368	1368
Acorns consumed per group	684	684
Meal consumed per lb. live-weight increase	2·95	3·37
Acorns consumed per lb. live-weight increase	1·47	1·68

	GROUP 1. Without Pear meal.	GROUP 2. With Pear meal.
Complete Experiment.		
Number of pigs in experiment	6	6
Duration of experiment in days	107	107
Average weight at beginning of experiment	55·5	56·5
Average weight at end of experiment	210	198·8
Total increase per group	927·0	854·0
Daily increase per pig	1·44	1·33
Meal consumed per group	2398	2398
Acorns consumed per group	1199	1199
Meal consumed per lb. live-weight increase	2·58	2·80
Acorns consumed per lb. live-weight increase	1·29	1·40

Second Experiment.

In this experiment only Large Whites were used. Two sows farrowed on 23 and 30 July 1943, respectively. The sows were kept in sties for 14 days as in the previous experiment. They and their litters were then put in lucerne camps. There was excellent grazing in the camps. The litters were started feeding in creeps when 3 weeks old. The first litter developed digestive disturbance due to the heated mealie meal referred to in the first experiment. They were weaned at 9 weeks. The average weight of 12 pigs was then 45 lb. The second litter was weaned at 8 weeks and the 11 pigs averaged 41 lb.

They were weaned in the sties, but were not dosed. Twenty of the twenty-three pigs available were selected and divided into two groups.

This experiment may be divided into two parts. In the first part the pigs were run on lucerne grazing. Two camps sown the previous year to lucerne were available, and were the same camps in which the pigs had run prior to weaning. There was more lucerne in the camps than the pigs were able to consume. As there was a considerable amount of separated milk available, it was decided to use separated milk instead of fish meal as used in the previous experiment. In other respects the treatment was the same.

200 lb. mealie meal,
100 lb. rye meal,
2 lb. separated milk for each lb. of meal, fed, and
½ lb. acorns for each lb. of meal.

In the pear-meal group 100 lb. of mealie meal was replaced by 100 lb. of pear meal.

The pigs remained on the lucerne for 10 weeks.

During the second period the pigs were confined in sties, 5 to each sty. They were fed exactly the same mixture as in the first period. The fattening period lasted for 45 days. No acorns were available for the last six days of the experiment and the meal fed to both groups was increased by 8 lb. per day. The separated milk was not increased as the extra meal was fed to replace the acorns. Throughout the experiment the health of the pigs was good and satisfactory gains were made.

The white pigs in both experiments suffered somewhat from sun-scald. The pigs grazing on lucerne were more severely affected than

those on the oats, but it was not severe enough seriously to affect their growth.

Results of Second Experiment.

The final weights were taken at 6.30 a.m. on the 24 July. The pigs were then fed and dispatched the same afternoon to Gouda. At 2 p.m. the following day they were again weighed at Gouda and then slaughtered. Details are given in Table II below.

The pear-meal group lost 4·5 per cent. between the weighing at Elsenburg and the weights taken at Gouda. The group without pear meal lost 3·9 per cent. The dressed weight of the pear-meal group was 80·3 per cent. of the weights taken at Gouda. The group without pear meal dressed at 81·1 per cent. All weights are given in lb.

TABLE II.

	GROUP 1.	GROUP 2.
	Without Pear meal.	With Pear meal.
First Period.		
Number of pigs in pexperiment	10	10
Duration of period in days	70	70
Average weight at beginning of experiment	48·9	49·3
Average weight at end of first period	138·9	137·0
Total increase per group	900·0	877·0
Daily increase per pig	1·28	1·25
Meal consumed per group	1688	1688
Acorns consumed per group	844	844
Milk consumed per group	3376	3376
Meal consumed per lb. live-weight increase	1·87	1·92
Acorns consumed per lb. live-weight increase	·93	·96
Milk consumed per lb. live-weight increase	3·75	3·84
Second Period.		
Duration of period in days	44	44
Average weight at beginning of period	138·9	137·0
Average weight at end of experiment	208·9	202·5
Total increase per group	700·0	655·0
Daily increase per pig	1·59	1·48
Meal consumed per group	1918	1918
Acorns consumed per group	816	816
Milk consumed per group	3748	3748
Meal consumed per lb. live-weight increase	2·74	2·92
Acorns consumed per lb. live-weight increase	1·16	1·23
Milk consumed per lb. live-weight increase	5·35	5·72
Complete Experiment.		
Number of pigs in experiment	10	10
Duration of experiment in days	114	114
Average weight at beginning of experiment	48·9	49·3
Average weight at end of experiment	208·9	202·5
Total increase per group	1600·0	1532·0
Daily increase per pig	1·40	1·34
Meal consumed per group	3606	3606
Acorns consumed per group	1660	1660
Milk consumed per group	7124	7124
Meal consumed per lb. live-weight increase	2·25	2·35
Acorns consumed per lb. live-weight increase	1·03	1·08
Milk consumed per lb. live-weight increase	4·45	4·65

The Bacon Sides.

Unfortunately, in the first experiment the markings on the sides became illegible in the curing process. The Large Blacks were, however, too short, too fat, and too heavy in the shoulder.

In the second experiment 18 sides were available from each group and were classified as follows:—

	Lean sizeable.	Medium.	Heavy.
Pear-meal Group	13	5	—
Without pear meal	9	6	3

The larger proportion of lean sizable was probably due to the rather low fattening qualitites of pear meal as opposed to mealie meal. This was also reflected in the lower back-fat measurements of the pear-meal group. The fat of the pear-meal fed pigs was harder than that of the group without pear meal. Had the pigs been purchased on a cured quality basis, the pear-meal pigs whould have recovered some and possibly all of the loss incurred owing to the lower weight at the time of sale.

Conclusions.

(1) Pear meal does not have as high fattening qualities as mealie meal, but in times of shortages of mealie meal it is of considerable value in replacing a portion of the mealie meal fed to pigs.

(2) If pear meal can be sold at a somewhat lower price than mealie meal, it is well worth purchasing as a feed for pigs.

(3) When pigs are purchased in South Africa on a quality basis pear meal can be regarded as being a suitable feed with a view to improving the quality of mealie-meal fed to pigs.

Acknowledgments.—The authors wish to thank the Deciduous Fruit Board for providing the pear meal free of charge for conducting the experiment, and the Imperial Cold Storage Co., Ltd., for providing all facilities to weigh, handle and measure the carcases and sides. We specially wish to thank Mr. Hiscock for grading the cured sides and for his valuable criticism and comments.

CITRUS FRUIT FOR FARM LABOURERS.

During the present Citrus Season, oranges will be made available to farmers, on behalf of their farm labourers, at 1s. 3d. per pocket, rail free, by the Citrus Board, under Scheme (C) of the State-Aided Citrus Fruit Distribution Scheme.

The quantity ordered per week must not be less than five pockets per consignment. Orders for more than five pockets must, upon first application, be supported by a certificate signed by a magistrate, justice of the peace, police officer or commissioner of oaths, that the quantity of fruit ordered is intended solely for consumption by the farmer's labourers, the number of which, with their dependants, must be stated on the form obtainable from the Secretary, Citrus Board, P.O. Box 1158, Pretoria.

It is trusted that farmers will make full use of these attractive facilities offered by the Department of Social Welfare through the Citrus Board.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 23 JUNE 1944 No. 262

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Price Review for April 1944.*

SLAUGHTER CATTLE.—The Johannesburg market was well supplied with slaughter cattle during the previous month. Offerings of mediums and especially compounds were plentiful. National mark primes and other best grades were also supplied in moderate quantities. In general, prices showed a weaker tendency, e.g., primes dropped from 85s. 3d. per 100 lb. estimated dressed weight *on the hoof* in March to 78s. 1d. in April; ordinary primes from 81s. 0d. to 73s. 9d.; good mediums from 75s. 5d. to 69s. 2d. and compounds from 63s. 10d. to 57s. 10d.

On the Durban market, supplies consisted chiefly of second and third grade cattle. Super qualities were very scarce. All grades, except undergrade beef, were sold at maximum prices during the first half of the month, but as a result of increasing supplies during the last half of the month, maximum prices could not be realized.

Slaughter Sheep.—Moderate supplies of slaughter sheep came on the Johannesburg market. Offerings included mainly medium merinos. The demand was good throughout and prices firm. The same average price level was obtained for prime merinos as during March, e.g., 13s. 0d. per lb. estimated dressed weight. Prices for medium merinos, however, advanced from 10·9d. per lb., estimated dressed weight to 11·8d.

On the Durban market a good demand for slaughter sheep was experienced and maximum prices were obtained.

Slaughter Pigs.—On the Johannesburg market the demand for baconers was moderate. There was a fairly heavy supply which was sold at a little lower level than that of the previous month, e.g., prime baconers at 7·5d. per lb. live weight and prime porkers at 7·1d. per lb. live weight. On the Durban market supplies consisted chiefly of prime and 2nd grade baconers and porkers. Prices remained on the same level as during the previous month.

* All prices mentioned are average.

Grain and Forage.—Although an increase was experienced in the supply of dry beans prices increased as a result of the keen demand, e.g., kaffirbeans on the Johannesburg market increased from 35s. 6d. to 38s. 9d. per bag; small white from 36s. 3d. to 47s. 1d. and speckled sugar from 62s. 6d. to 71s. 6d. Supplies of lucerne were smaller on the Cape Town and Durban markets. The Johannesburg market was well supplied and as a result of a firm demand prices advanced from 4s. 10d. to 5s. 3d. per 100 lb. and from 6s. 9d. to 7s. 6d. on the Cape Town market. Supplies of teff-hay improved but oat-hay remained scarce.

Potatoes.—The supplies of potatoes were very limited on all markets, while the quality was also unsatisfactory. Consequently a sharp increase in prices were experienced. On the Johannesburg market prices of 1st grade National Mark No. 2 increased from 17s. 1d. per bag for March to 27s. 11d. for April and Transvaal No. 1 from 16s. to 23s. per bag. On the Cape Town market prices reached a very high level and up to 45s. per bag was realized.

Onions.—Smaller supplies were offered and sold at satisfactory prices throughout. Cape onions sold at 16s. 10d. per bag on the Johannesburg market in comparison with 14s. 10d. for the previous month.

Tomatoes.—Supplies of tomatoes were small on most markets and prices firm. Supplies on the Johannesburg market, however, increased from the beginning of the month, and prices consequently dropped from 8s. 1d. per tray for March to 5s. 10d. for April.

Vegetables.—Supplies decreased in general. Consignments were irregular and consequently lower average prices were realized for most kinds of vegetables. On the Johannesburg market green beans and green peas were fairly plentiful as a result of increased supplies from the lowveld and sold at lower prices than during March.

Fruit.—During the past month the fruit division of the markets changed over from deciduous fruit to heavier consignments of tropical fruit. Apple consignments, however, remained large, while decreasing supplies of pears and grapes were experienced. Prices of the latter fruit consequently increased. Citrus fruit arrived on the market in increased quantities and was sold at the lower fixed winter-price levels. Large supplies of avocados and guavos were offered and prices dropped a little in general. Pineapples and bananas were scarcer than during March.

Eggs and Poultry.—The supply of eggs decreased and sold at higher prices. Prices of new-laid eggs on the Johannesburg market increased from 2s. 10d. to 3s. 1d. per dozen. The supply of fowls was firm and prices showed a slight increase.

Index for Prices of Field Crops and Pastoral Products.

As shown elsewhere in this issue this index increased from 157 in March to 162 in April (basic period 1936-37–1938-39). The most important price increases occurred in the following groups:—

1. Hay, e.g., from 124 to 132 mainly as a result of the increase in prices of lucerne.
2. "Other Field Crops", e.g., from 179 to 262 as a result of the increase in prices of potatoes, onions and dry beans.

3. Poultry and poultry products, e.g., from 240 to 279 mainly as a result of the increase in prices of eggs.

The most important decrease occurred in the group slaughter stock, e.g., from 174 to 170 as a result of a decline in prices of slaughter cattle.

Potato Prices.

As a result of superfluous rains the summer crop of potatoes of the High Veld of Transvaal, which is the most important potato production area of this country, was considerably decreased and a relative shortage occurred on the important markets. Prices realized a very high level with a tendency to advance still further.

On account of this, the Government has decided to exercise a certain amount of price control. A maximum retail price of 5 lbs. for 1s. has been fixed, viz., from 21 April 1944. This decision, however has been withdrawn and as from 5 May, 1944, a maximum price of 5 lbs. for 1s. has been fixed for any quantity of potatoes sold by any person. In other words, producers prices, as well as wholesale and retail prices, may not exceed the amount calculated at the rate of 5 lbs. for 1s.

For full particulars regarding this price fixation, see the Government Gazette Extraordinary of the 5th May, 1944.

The failure of the summer crop, however, makes it very essential that the winter production in the Lowveld areas should be increased and the Government accordingly decided to announce in advance, a minimum price of 22s. 6d. per bag for 1st grade potatoes marketed during the period 1st August to 15th November of this year. Where necessary the Controller of Foodstuffs will operate on the various markets, during this period, in order to ensure that this minimum price be realized by the producer.

Prices of Maize and Maize Products for the 1943-44 Crop.

PRICES of all maize and maize products have been fixed as follows for the present season commencing 1 May 1944:—

Producers' prices.—Producers must sell at the following prices:—

	Grades 2 *and* 6.	*Grades* 3, 4, 5 *and* 7.	*Grade* 8.
	s. d.	s. d.	s. d.
In bags..................................	17 6	17 4	17 1
In elevators..........................	16 5	16 3	16 0

These prices are free-on-rail sender's station.

To producers who market more than 500 bags in all during the season, the Board will make a supplementary payment of 6d. per bag at the end of the season.

Consumers' prices will be maintained on the level of last year's average. This has been made possible as a result of a subsidy which the Government will make available to the consumer in general.

Maximum consumers' prices will be 18s. 7d. per bag for grades 2 and 6; 18s. 5d. per bag for grades 3, 4, 5, and 7 and 18s. 2d. per for grade 8. Railage and other transportation costs are to be paid by the buyer and are not included in these prices.

Maximum consumers' prices as well as maximum millers' prices have also been fixed for all kinds of maize products.

In the case of seed maize a minimum price of £1 per bag has been fixed.

For full particulars regarding the buying and selling of maize and maize products during the present season, see the Government Gazette Extraordinary of 28th April, 1944.

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (*a*)	Fertilizers. (*b*)	Fuel. (*c*)	Bags. (*d*)	Feeding Stuffs. (*e*)	Fencing Material. (*f*)	Dipping and Spraying Material. (*g*)	Building Material. (*h*)
Base—								
1936–38........	100	100	100	100	100	100	100	100
1939..........	105	106	98	146	90	114	100	103
1940...........	120	139	117	171	95	176	112	124
1941.	124	170	124	175	109	208	115	144
1942—								
January........	121	146	125	188	115	229	117	164
April..........	122	146	134	194	127	228	117	165
July...........	124	146	146	220	147	231	118	167
October........	124	146	152	224	145	230	118	171
1943—								
January........	126	145	154	232	144	238	123	174
April..........	126	145	154	234	150	238	123	176
July...........	126	145	156	235	155	239	131	179
October........	142	168	156	249	149	240	131	181
1944—								
January (*j*).....	154	161	156	304	149	240	131	182
April..........	149	161	156	301	151	236	131	184

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

(*a*) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land sides, mouldboards, knife, pitman, guard.

(*b*) Superphosphate, ammonium sulphate, potash-muriate, bonemeal.

(*c*) Petrol, power paraffin, crude oil, grease, lubricating oil.

(*d*) Woolpacks, grain bags, sail twine, binder twine.

(*e*) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.

(*f*) Fencing wire, standards, baling wire.

(*g*) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.

(*h*) Corrugated iron, deals, cement, lime, flooring boards.

(*j*) Preliminary.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938 39	92	107	96	89	79	102	106	92	94
1939-40	86	107	77	95	115	105	106	89	103
1940-41	109	113	106	156	102	108	110	104	108
1941-42	121	134	143	203	102	131	134	145	123
1942-43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158
February	168	183	134	188	122	144	176	235	158
March	167	183	124	179	122	144	174	240	157
April	167	183	132	262	122	144	170	279	162

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet-potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Slaughter Cattle.

BEEF per 100 lb.

SEASON (1st June to 31st May).	Johannesburg. (a) Prime. No. 1.	Johannesburg. (a) Good Medium. No. 2.	Johannesburg. (a) Medium. No. 3.	Johannesburg. (a) Compound. No. 4.	Cape Town. (a) Prime. No. 1.	Cape Town. (a) Good Medium. No. 2.	Cape Town. (a) Medium. No. 3.	Durban. (b) N.M. Good. No. 1.	Durban. (b) Good Medium. No. 2.	Durban. (b) Medium No. 3.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	39 0	36 3	33 9	31 7	36 8	34 3	31 11	—	33 0	—
1939-40	38 5	35 5	33 0	30 10	37 11	35 4	32 0	—	33 7	—
1940-41	41 4	37 11	34 11	32 4	41 1	38 0	34 9	—	34 0	31 3
1941-42	52 1	47 4	42 6	38 4	52 3	48 1	43 1	45 9	—	40 3
1942-43	63 2	57 9	51 5	46 1	60 4	56 3	50 6	55 11	—	45 6
1943—										
January	62 10	57 2	52 1	47 10	63 11	59 3	53 9	55 9	51 0	45 6
February	60 11	55 8	49 11	44 5	62 8	58 3	51 9	55 1	50 4	43 11
March	59 2	54 4	48 1	43 4	57 8	53 8	47 8	52 1	46 8	41 0
April	60 8	55 8	48 4	43 4	59 7	55 0	49 5	52 5	47 2	42 1
May	59 11	55 3	48 11	43 9	61 3	56 11	51 0	52 6	47 6	42 6
June	58 2	54 9	46 10	46 2	58 11	54 8	49 2	52 6	47 6	42 6
July	66 10	63 11	60 3	55 0	66 5	60 2	53 5	57 10	50 5	45 6
August	70 8	65 3	60 6	56 0	75 4	67 9	58 10	63 0	55 0	49 0
September	76 11	72 10	69 0	65 8	76 4	68 7	60 5	63 0	55 0	49 0
October	81 11	77 10	70 8	65 8	78 11	72 0	64 11	63 0	55 0	49 0
November	81 0	75 5	69 5	63 10	87 10	78 11	69 3	63 0	55 0	49 0
December	73 8	69 2	62 10	57 10	89 2	82 2	72 2	63 0	55 0	49 0
1944—										
January	69 11	66 2	60 11	55 8	82 10	77 8	68 0	63 0	55 0	49 0
February	68 6	64 2	56 2	48 5	75 8	70 10	62 6	63 0	55 0	49 0
March	66 3	60 4	53 2	46 5	70 10	65 2	59 2	63 0	55 0	49 0
April	64 0	57 4	49 2	43 2	63 0	57 9	51 7	61 8	52 1	46 1

(a) Estimated dressed weight of cattle as sold on the hoof.
(b) Dressed weight of carcase sold on the hook. According to new meat regulations as from October, 1942, No. 1 corresponds approximately to N.M. good, No. 2 to good medium, and No. 3 to medium.

Average Prices of Sheep and Lambs.

SEASON (1st June to 31st May.)	MUTTON (per lb.). Johannesburg. (a) Merino Hamels. Prime.	Medium.	Cross-breds. Prime.	Cape Town. (a) Merino. Prime.	Persians and Cross-breds. Prime.	Durban. (b) Prime. No. 1.	Medium. No. 2.	LAMB (Prime) (per lb.). Johannesburg. (a)	Cape Town. (a)	Durban. (b) No. 1.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·3	5·5	5·8	5·8	5·9	6·1	5·3	6·7	6·4	8·3
1939–40	6·5	6·0	5·9	5·9	5·9	6·3	5·5	6·8	6·6	8·0
1940–41	6·7	6·1	6·2	6·1	6·3	6·5	5·8	7·0	6·6	8·0
1941–42	8·3	7·4	7·5	7·7	7·6	7·7	6·9	8·6	8·1	8·8
1942–43	11·5	9·8	9·8	10·7	10·5	10·5	9·6	11·4	10·8	11·3
1943—										
January	11·2	9·4	9·5	10·8	10·4	10·7	9·9	11·2	10·8	11·1
February	10·5	8·6	8·2	10·1	10·1	10·5	9·4	10·4	10·2	11·0
March	11·5	9·8	9·0	11·7	11·1	10·2	9·1	11·5	11·3	10·9
April	12·0	10·2	9·5	12·4	11·6	10·3	9·5	12·0	11·8	11·0
May	12·0	10·3	9·6	11·1	11·1	10·3	9·5	11·8	11·2	11·0
June	11·4	10·2	10·4	10·8	11·0	10·3	9·5	11·8	11·3	11·0
July	11·4	10·3	10·3	11·4	11·2	10·5	9·8	11·7	11·2	11·1
August	11·8	10·2	10·8	12·4	12·2	10·8	10·0	11·9	12·6	11·3
September	12·8	10·9	12·0	12·0	12·0	10·8	10·0	13·1	12·2	11·3
October	11·5	9·6	10·1	11·3	11·2	10·8	10·0	12·1	11·5	11·3
November	11·9	10·1	10·6	10·9	11·1	10·8	10·0	12·6	11·4	11·3
December	12·9	11·4	11·5	11·6	12·0	10·7	10·0	12·9	12·1	11·3
1944—										
January	12·4	10·4	10·9	12·1	12·0	10·8	10·0	12·5	11·8	11·3
February	12·3	10·3	9·6	11·6	11·7	10·8	10·0	12·6	11·7	11·3
March	13·0	10·9	11·7	12·4	12·4	10·8	10·0	12·2	12·5	11·3
April	13·0	11·4	11·8	12·7	12·9	10·8	10·0	13·1	12·9	11·3

(a) Estimated dressed weight as sold on the hoof.
(b) Dressed weight on the hook.

Average Prices of Pigs.

SEASON (1st June to 31st May).	Johannesburg. (a) Baconers. Prime.	2nd grade.	Porkers. Prime.	2nd grade.	Stores.	Durban. (b) Baconers. Prime.	2nd grade.	Porkers. Prime.	2nd grade.
	d.	d.	d.	d.	d.	d.	d.	d.	d.
1938–39	6·2	5·7	5·3	4·9	5·0	6·7	6·2	7·6	6·6
1939–40	5·6	5·1	5·2	4·7	4·8	6·7	6·1	7·2	6·3
1940–41	5·4	4·5	4·5	3·8	4·0	6·8	6·3	7·1	6·3
1941–42	6·6	5·2	5·1	4·0	4·5	8·1	7·1	8·1	6·9
1942–43	8·6	7·5	7·2	6·0	6·9	10·3	9·0	10·6	9·1
1943—									
January	8·4	7·7	7·8	6·6	8·4	9·4	8·5	10·3	9·1
February	8·8	7·8	7·4	6·3	8·0	10·2	9·3	10·5	9·4
March	8·8	7·7	6·8	5·7	6·2	11·4	10·1	11·3	9·9
April	9·1	8·1	6·9	5·9	6·5	11·2	9·7	11·5	9·7
May	8·7	7·8	7·6	6·7	6·6	11·9	10·7	12·1	10·4
June	8·7	7·8	8·3	7·4	7·4	11·4	9·9	11·4	9·8
July	8·6	7·7	8·4	7·1	7·1	10·6	8·8	11·9	9·2
August	8·7	7·5	8·4	7·2	7·2	10·8	9·1	10·0	8·5
September	8·9	7·6	7·7	7·0	7·4	10·9	9·9	11·3	10·2
October	8·8	7·7	7·7	6·9	7·8	10·3	8·6	10·0	8·4
November	8·4	6·4	7·7	6·8	7·5	10·2	8·8	10·7	8·8
December	7·7	6·4	8·1	7·2	7·3	10·3	8·8	11·3	9·8
1944—									
January	7·3	6·0	7·6	6·3	6·5	8·7	7·3	10·9	9·1
February	7·2	6·1	7·7	6·6	6·9	8·5	7·2	10·8	8·9
March	7·6	6·4	7·4	6·5	6·3	9·9	8·5	11·7	10·1
April	7·5	6·1	7·1	6·1	6·4	10·3	8·8	11·4	9·8

(a) per lb. live weight.
(b) per lb. on the hook.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1st July to 30th June).	Eggs. Johannesburg, New Laid. Per Dozen.	Eggs. Durban, New Laid. Per Dozen.	Eggs. Cape Town. Per 100.	Fowls (Live, each). Johannesburg.	Fowls (Live, each). Durban.	Fowls (Live, each). Cape Town.	Turkeys (Live, each). Johannesburg.	Turkeys (Live, each). Durban.	Turkeys (Live, each). Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942-43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 8
1944—									
January	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11
February	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March	2 10	2 9	19 10	4 1	4 11	4 7	13 5	18 3	13 4
April	3 2	3 5	24 5	4 2	5 3	4 1	15 0	17 0	13 8

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.). Johannesburg (a). Cape.	Lucerne (per 100 lb.). Johannesburg (a). Transvaal.	Lucerne (per 100 lb.). Cape Town 1st. grade.	Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.). F.o.r. Producers Stations. K1.	Kaffircorn in bags (200 lb.). F.o.r. Producers Stations. K2.	Dry Beans (200 lb.). bags. Johannesburg (a). Speckled Sugar.	Dry Beans (200 lb.). bags. Johannesburg (a). Cow Peas.	Dry Beans (200 lb.). bags. Johannesburg (a). Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2
February	5 2	3 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March	4 11	3 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6
April	5 3	4 6	—	3 9	17 9	17 7	71 6	38 9	44 0

(a) Municipal Market.
(b) Seasonal year for Kaffircorn 1st June–31st May; Dry Beans 1st April–31st March; Lucerne and Teff 1st July–30th June.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season (1st July to 30th June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade I.		Natal.	O.F.S.	Transvaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939–40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940–41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941–42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942–43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 6	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	18 1	14 10	11 6
April	23 1	21 11	30 2	30 4	29 9	25 11	28 4	30 2	24 0

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

Season. (1st July to 30th June).	Onions (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johanburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939–40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940–41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941–42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942–43	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June	17 3	17 4	15 3	18 1	12 0	18 9	8 5	8 6	9 2
July	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
November	16 5	—	19 7	—	22 9	25 1	13 5	11 11	10 8
December	12 11	13 10	9 3	15 1	18 6	16 6	12 0	10 5	9 9
1944—									
January	11 3	10 9	8 8	12 3	9 6	11 7	14 1	9 4	11 10
February	12 7	14 0	7 10	11 7	12 9	13 9	15 8	10 10	11 6
March	14 4	14 10	11 1	15 0	13 5	15 1	12 11	8 6	10 10
April	16 6	16 11	13 7	17 0	14 0	18 2	12 6	8 8	9 8

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[*Photo on Cover by S.A.R. & H.*]

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 15s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.
Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmers' Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ...AFRICA

Vol. 19 JULY 1944 No. 220

Editorial:

Prevention of Diseases.

An exceptionally important part of the research work on any disease in man or animal relates to the conditions under which such disease occurs. Such a study is the more important in the case of infectious and parasitic diseases, which may spread rapidly under favourable conditions. The control of such diseases demands an exact knowledge of those factors which constitute "favourable conditions" and of the methods by which the virus and parasites spread.

In South Africa, where farming operations are usually carried on extensively and the individual animal, as a rule, is not particularly valuable, veterinary science has concentrated more on the prevention of infectious and parasitic diseases than on the treatment of individual sick animals. In the treatment of infected animals the chief aim is—or rather should be—the elimination of animals as a source of infection.

In this direction we have made considerable progress and, in spite of the fact that the means at our disposal are not always perfectly effective, we can still succeed in repelling and preventing numerous diseases, provided we apply the available means in the right manner and in good time.

In this connection special emphasis should be laid on the time factor, for only too often we find that people are not mindful of the fact that prevention is better than cure. This tendency is understandable, as it appears almost unnatural to take steps in winter, of all times, against diseases which may break out in summer and *vice versa*. We must, however, appreciate the necessity for this procedure which can be compared to the pruning of trees in winter, and not in summer when the trouble would normally appear. The following are a few important examples.

Horse-sickness and blue-tongue can appear at any time during summer, but are usually more severe towards the end of the summer (February-April). Whether a disease will be severe during a particular year depends to a large extent on the rainfall and consequently many people delay the inoculation of their animals against diseases until they are satisfied that the summer will be a wet one. This delay entails the placing of numerous orders for vaccine at a time when the stock is almost depleted. There are, however, further disadvantages. Proper immunization as a result of inoculation is a process which requires some time—in the case of horse-sickness about three months. In these circumstances inoculation of a horse which will contract the disease within a month will not prove very effective. Since outbreaks of the disease occur as early as October, it is recommended that the horses be inoculated in July. In areas where the disease occurs later than usual, the operation may be carried out a little later, but it is definitely desirable not to wait later than November. For this reason vaccine is supplied from 15 June to 15 December only.

In the case of blue-tongue the immunization process lasts as long as three weeks. Moreover, sheep which react to the treatment are strongly affected by the sun during summer and suffer a more severe setback in consequence than from the inoculation itself. For this

reason it is recommended that the inoculation operation should be carried out early in September. In such cases it is possible that the immunization may have lost much of its effectiveness towards February-March in those areas where blue-tongue occurs particularly severely and that a second inoculation in January may be necessary. Such second inoculation produces practically no reaction and the sheep will then not be affected by the sun.

Since we are dealing with the matter of inoculation against diseases it will not be out of place to point out that it will after all pay better to inoculate every year against anthrax and black quarter and spend a penny or more per animal than to lose a few head of cattle and allow the disease to establish itself again firmly on the farm as a result of the development of millions of germs.

In summer worm parasites are particularly active and vermicides are dosed. It is always best to tackle an enemy while he is weak. We know that most worm-infestations in the veld die during winter. Those which survive are mainly those harbouring in our animals, and for this reason we must treat the animals during winter or as soon as the veld begins to sprout, even if the animals show no signs of infestation, for we know that the worms are present and that they constitute a source of infestation for the ensuing summer.

In the case of lice, the problem is just the reverse. Lice live on their host animal, where they continually multiply and the infestation is spread by close contact with other animals. As long as the host animal remains in good condition, it offers good resistance to these parasites, but as soon as its condition weakens the lice population rapidly increases. Lice, therefore, becomes a pest during winter and particularly towards the end of this season. Unfortunately animals cannot be dipped at this time and no other satisfactory method of treatment has been discovered as yet. So it is necessary to control lice before the advent of winter. The most suitable time for carrying out these operations is towards the end of summer. The animals should be dipped twice and an interval of fourteen days allowed since the first dipping will not exterminate nits.

Tick-infestation sometimes occurs most severely at the beginning of winter and in spring as soon as hot weather sets in. This phenomenon is particularly striking in the border areas of the East Coast fever and heartwater regions, i.e., in areas where ticks still appear fairly abundantly although actual outbreaks of the disease seldom, if ever, occur. In the tick and tick-borne disease areas proper regular dipping is imperative and so we find that the tick population in those regions is diminishing. In the border areas, however, dipping operations are carried out rather erratically and in consequence numerous ticks are found in these localities. At the beginning of winter, when the animals are no longer dipped, ticks enjoy most favourable conditions before their activities are stopped by cold. At this time the females lay thousands of eggs, which remain on the ground until spring, when they hatch and numerous ticks emerge. The only method of controlling the pest is by dipping the animals regularly during summer and by making sure that the dip fluid is of the right concentration. Moreover, all animals which are liable to infestation, such as horses, should be dipped, and not cattle alone.

We must bear in mind that prevention is better than cure, not only because it saves labour but also because it is more economical.

(Dr. H. O. Mönnig, Onderstepoort.)

Transmission of Horse-sickness and Blue-tongue in South Africa*.

R. du Toit, Veterinary Research Officer, Onderstepoort.

THE two diseases, horse-sickness of equines and blue-tongue of sheep, have played a profound part in the development of the live-stock industry of South Africa, and a great deal of attention has been focussed upon the question of their transmission in the past. At the beginning of the present century Sir Arnold Theiler commenced his researches into the occurrence and control of these diseases, horse-sickness in particular receiving special attention on account of the great economic value of the horse at that time.

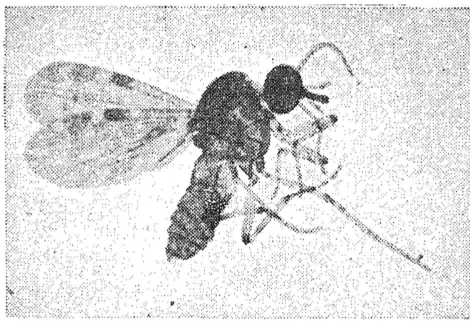
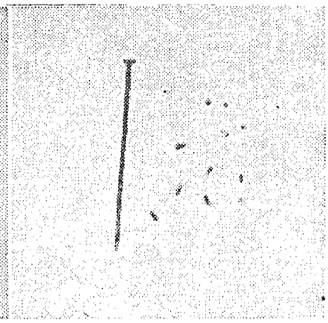

Fig. 1.—*Culicoides*. Adult female, magnified 20 times. Fig. 2.—*Culicoides*. Natural size, with a 1-inch office pin for comparison of size.

This work and that which followed in the ensuing years has been productive of very considerable advances in our knowledge. This is particularly true in respect of the development of preventive measures, and in this field the progress made in South Africa has not lagged behind the spectacular advances in preventive medicine in other parts of the world. A gap in our knowledge of the ways in which these two diseases are disseminated has persisted, however, and, although work on the subject has been conducted over the past 40 years, the problem has resisted all attempts at its solution.

In the early days of these investigations the close study of the conditions under which the diseases in question occurred, indicated the probability of an insect transmitter being involved. The experimental work of Theiler, Watkins-Pitchford and others, not to mention the remarkably accurate observations of farmers in particular, confirmed these earlier conclusions, and by correlation with such diseases as malaria, yellow fever and dengue fever of man, where mosquitoes have been shown to be the transmitters, mosquitoes came to be looked upon as the most likely group to be involved. Attempts at demonstrating the capacity of one or more species of mosquitoes to transmit these diseases have been entirely negative and, in fact, the conclusions arrived at by Nieschulz, Bedford and du Toit at the termination of their experimental work carried out

*An article of a more comprehensive nature which includes details of the experimental work conducted during 1943 together with a description of the type of light trap employed and the methods used in handling, feeding and storing the *Culicoides* is at present in the press and will appear in the *Onderstepoort Journal of Veterinary Science and Animal Industry* in the near future.

between 1931 and 1933 were that mosquitoes were in all probability not involved in the transmission.

Light-trapping of Insects.

In spite of repeated investigations of outbreaks of these diseases in various parts of the Union, no further evidence was forthcoming until early in 1943. Profiting by the experience of American workers in their investigations in connection with malaria, the writer was able to utilize, for trapping night-flying insects, a modification of the so-called New Jersey Light Trap, which had been devised for trapping mosquitoes.

The trap very soon gave proof of its ability to catch, at night, almost incredibly large numbers of various species of a minute blood-sucking midge of the genus *Culicoides*, and it was generally possible in the summer months to remove several thousands of these midges from a single trap after the night's catch. The genus contains a large number of species of very small two-winged flies which suck blood readily. In South Africa they are popularly referred to (in Afrikaans) as " brand assies " or " warm as ", while in America they are known as " punkies ", and in some parts of the world as " sand flies ". Some attention had been paid to this group in the past, and several scientific workers had looked upon the midges as possible transmitters of horse-sickness and blue-tongue, but no success had attended their efforts towards incriminating them as transmitters of these diseases.

The success attending the use of the light trap in catching large numbers of *Culicoides* suggested a new approach to the problem of transmission. If it could be demonstrated that the midges caught at night during the period of the year when the particular diseases were prevalent, actually harboured the viruses of these diseases, this would afford a strong indication that the group was possibly involved in the transmission, although final proof would consist in showing that the insects were capable of setting up the diseases by actually biting susceptible animals.

Experiments to Incriminate Culicoides.

In order to show that the viruses were present in the midges, it was necessary to have an abundant supply of wild trapped midges available. This the light trap now made possible, as only with large numbers would it be likely to find the few that might be infected. The method of demonstrating the presence of the viruses consisted of grinding up large numbers of these trapped midges and making a suspension of them in a salt solution and serum from normal animals. After clarifying, this was injected into susceptible animals.

Emulsions of *Culicoides* caught in the environs of Onderstepoort, a notorious horse-sickness area, were injected at weekly intervals into susceptible horses and sheep throughout the summer months of 1942 and 1943. Negative results were obtained consistently throughout the months of August 1942 to February 1943. In March 1943 one typical case of horse-sickness was produced by the injection of *Culicoides* caught between the 4th and 17th of that month, and during March, April and May three cases of blue-tongue in sheep were produced in a similar manner. Injections were continued during the winter months, as *Culicoides* were found to persist even after frosts had been experienced, but no further cases either in horses or sheep could be produced.

During the summer of 1943-1944 similar results were obtained. No cases of the diseases in question could be produced during the

earlier summer months, but in March and April 1944 three horses succumbed to typical horse-sickness, two cases being of the "dunkop" type and one of the "mixed" type, following upon injections of emulsions of *Culicoides* caught in the wild state. At the same time similar injections were being carried out at weekly intervals in the case of sheep and, in all, seven cases of typical blue-tongue were produced between 16 February and 13 April 1944.

In this connection it is interesting to note that two of the batches, namely, those injected on 5 and 13 February 1944 into both horses and sheep produced both diseases simultaneously—typical horse-sickness in two horses and blue-tongue in two sheep. This would appear to indicate that the insects may be capable of harbouring the viruses of both diseases simultaneously.

The above evidence is strongly suggestive of the supposition that *Culicoides* are associated with the transmission of horse-sickness and blue-tongue. These experiments were conducted, however, at a time when both diseases were actually occurring in the neighbourhood, and the possibility therefore exists that some of the specimens injected might have contained in their abdomens fresh blood derived from animals naturally infected during the course of the diseases. Should this have been the case—and it must be stated that the minute size of the insects and the numbers dealt with made it impossible to exclude all engorged specimens—the cases of the diseases produced may have had their origin in virus contained in the freshly ingested blood which was injected together with the insects. Further proof was necessary, therefore, in order to incriminate the species as actual transmitters and capable of producing the diseases by bite.

In September 1943 *Culicoides* caught by means of light traps were allowed to feed upon a sheep suffering form blue-tongue during the early portion of the temperature reaction. After having fed, the engorged specimens were kept in the laborartory for a period of ten days during which they were fed upon sugar and water, and then allowed to feed again upon a normal sheep. On the sixth day following this second feed a temperature reaction commenced in the sheep and persisted for 5 days, after which the sheep showed the symptoms typical for blue-tongue. In order to prove that the disease so transmitted was actually blue-tongue, an injection of blood known to contain blue-tongue virus was given subsequently. No reaction resulted from this blood injection, thus demonstrating that an immunity to blue-tongue had been conferred by the initial infection produced by the bites of the *Culicoides*. During the period of reaction of this sheep further *Culicoides* were fed and these, after having been stored for a period of 8 days, again produced typical blue-tongue in a normal sheep by their bites. It must be noted here that these experiments were conducted during September and October 1943, during which months it had not been possible to demonstrate the presence of blue-tongue virus in trapped *Culicoides* by injections of the insects. The assumption is ,therefore, that the insects became infected during their feed upon a sheep suffering from blue-tongue, and that, after a period of development of the virus in their internal organs, they were capable of transmitting this virus to normal sheep. In all, ten successful transmissions of blue-tongue in sheep by the bites of *Culicoides* were obtained in 1943 and 1944.

Conclusions.

The work in connection with the transmission of horse-sickness and blue-tongue is still in its initial stages, and many problems remain to be solved. The evidence provided up to the present is

[*Continued on page* 436.

The Freezing Point of Milk*.

IN the dairy industry, the adulteration of milk by the addition of water is a serious problem requiring continuous vigilance. The various properties of milk, as for example the fat content, the solid content, the density and opacity, have in the past been suggested as means of showing adulteration. None of these has, however, been found satisfactory, because even in normal milk these properties are subject to variations. It was therefore necessary to find a property of milk which is much more constant, in spite of the wide variations in composition. It has been found that the freezing point complies with those requirements.

The freezing-point of milk is about 0·5° C. lower than that of pure water, for milk contains various substances in solution, especially lactose and chlorides, which lower the freezing-point. Although the freezing-point is the most constant property of milk, small variations are found here too. It is therefore necessary to determine an average figure for the freezing-point of milk.

The differences are caused by various factors, as for example, the composition of the milk, especially as regards the quantities of lactose and soluble salts, the osmotic pressure of the milk, which is dependent on the osmotic pressure of the blood, the forming of acids in the milk, the presence of colostrum, sickness, lactation period, environmental factors, the season of the year, pasteurization and the presence of tricresol. The latter lowers the freezing-point, whereas pasteurization raises it.

The freezing-point of milk is determined by means of the cryoscope. The apparatus consists of a cylindrical Dewar flask containing ether. Dry air is blown through this to lower the temperature. In the flask is a metal tube which contains the freezing-tube. The freezing-tube contains a sample of the milk, a stirrer and a standard thermometer with graduations from −2 to +1° C. and on which the temperature can be read to 0·001° C.

In this examination, milk from different cows and from the herd on the experiment farm of the Agricultural Research Institute, Pretoria, was analyzed. The aim of the experiment was to determine whether the percentage of total solids, ash, milk-fat, solids-not-fat, acid and the density of the milk, affected the variations observed in the freezing-point.

The following table indicates the results obtained from the analysis of 183 samples of milk:—

	Minimum.	Maximum.	Average.
	%	%	%
Total solids	11·78	14·54	12·45
Ash	0·55	0·74	0·64
Milk-fat	2·90	5·30	3·50
Solids-not-fat	8·49	8·84	8·70
Acids	0·17	0·20	0·19
Density	1·0300	1·0331	1·0317

In spite of these large variations it has been found that no relationship exists between the proportions of these constituents and the freezing-point of milk. The freezing-point of milk ranged from

*Summary of a thesis by H. J. Ligthelm for a B.Sc. (Agric.) degree at the University of Pretoria.

 [Continued on page 434.

Nicotine for Aphids.

Dr. Bernard Smit, Principal Entomologist, Pretoria.

ALMOST every crop grown in South Africa is subject to attack by aphids, which are often called plant lice, blight or green flies. There are many different species of these, but they all suck the sap from the plants and reduce their vitality and the subsequent crop. In some cases the aphids also transmit serious virus diseases, as for instance, the leaf-roll disease of potatoes. By sucking out the sap they cause plants such as cabbages and tobacco to be stunted and finally to turn yellow and die. In the case of tobacco also the honey-dew produced on the leaves makes these unsuitable for curing. When young growing shoots are attacked, as on citrus trees, the shoots wither and many young fruits drop off just after setting. Infested peach leaves curl up and become deformed, and many garden plants just wilt and shrivel up. The growing shoots and buds of roses are often attacked and destroyed.

Aphids are remarkable for their rapid rate of reproduction and for their sudden appearance in enormous numbers. In this way they often take the farmer or gardener completely by surprise and do a great deal of damage before he has noticed their presence. This is particularly the case in the spring, so that all who grow field crops and fruit should be on the lookout for these aphids and should control them as soon as possible at that time of the year.

Fortunately, these insects are soft-bodied and can easily be killed with a contact insecticide. One of the most effective contact insecticides for this purpose is nicotine, and this can be used in various forms.

Tobacco Extract.

An extract or concoction of tobacco can be made by simply soaking tobacco leaves in water for 24 hours or by pouring boiling water over them and then letting them cool. The extract should not be boiled, for nicotine is volatile and is driven off with the steam. Powdered leaves and stems are used, or sometimes tobacco sweepings from warehouses. The difficulty with this method is to obtain a strong enough extract of uniform strength, particularly with our South African smoking tobaccos, which contain on an average only about 2 per cent. of nicotine.

In order to kill aphids, the spray should contain not less than 0·05 per cent. of actual nicotine, that is, one part in two thousand parts of spray. To get this strength, about 100 lb. sweepings is needed to make 100 gallons of spray. Where roll tobacco can be obtained cheaply, it can be used at the rate of about 50 lb. per 100 gallons or, on a small scale, ½ lb. per 1 gallon. This is because roll tobacco contains much more nicotine than sweepings. The soaking or leaching method has often been used successfully on farms where there is a surplus of waste tobacco. Some tobacco factories in South Africa in the process of manufacturing their smoking mixtures have also produced a solution of nicotine in water as a by-product which was used successfully against aphids by people in the neighbourhood.

The extract should be used at once because it will not keep. In a few days it begins to ferment and then loses its strength. The large volume required also makes it impractical to transport it any great distance. It is difficult to standardize this extract without careful laboratory analysis. The dark heavy types of tobacco give more nicotine than the light types, and with a heavy smoking tobacco

in America it was found that 28 lb. per 100 gallons of water would give the required strength for aphid control. Much depends on the locality in which the tobacco is grown.

After the powdered tobacco leaves and stems have been soaked for 24 hours the mixture should be strained carefully to remove all solid matter and prevent spray pumps and nozzles from being clogged.

Practically all the tobacco extract that has been used in South Africa to control aphids has been imported, and it seems very strange that this should be the case seeing that this is a tobacco-growing country. The reasons for this are various and rather difficult to understand, but on the whole they have been mainly of an economic nature. As the demand for nicotine increases, however, and as it becomes more difficult to obtain it from overseas, the possibility of establishing a nicotine-extract industry in South Africa becomes greater. The price of nicotine is now about twice as much as it was before the war, but in small quantities, i.e. in one-ounce bottles, it has recently been sold at exorbitant prices running up to £20 per gallon. With this in view, the Department of Agriculture and Forestry is continuing its investigations in connection with the production and use of this valuable product.

If our low-grade tobacco, which contains about 2 per cent. of nicotine, could be produced for about 2d. per pound and a factory for making a concentrated extract could be started, it is possible that a profitable industry might develop. On the other hand there is another type of tobacco which gives a much higher yield of nicotine than does the ordinary smoking tobacco, and experiments in growing this are being carried out at Rustenburg.

This tobacco is called *Nicotiana rustica* or the *Rustica* type of tobacco. The plants are smaller than the ordinary tobacco plants, but their dried leaves contain up to 12 per cent. of nicotine. The plants seem to grow well in South Africa, but they would have to be grown specially for nicotine production, and whether this is an economic proposition is still an open question.

Recently the Department of Agriculture and Forestry sent one of its most capable and experienced chemists to study the whole question of nicotine production in Central Africa and much valuable information was gathered in that area, the climate of which is very suitable to the growing of high-nicotine tobacco.

Wetters and Spreaders.

Because aphids are sucking insects and because we therefore use a contact insecticide like nicotine to kill them, the nicotine must thoroughly spread over and wet the insects.

Moreover, aphids are more or less covered with wax. This is sometimes in the form of fine particles, which cause the insects to appear as if they were covered with grey powder, as in the case of the cabbage aphid. It is sometimes in the form of cottony fibres, as on the woolly apple aphid. In every case this wax tends to protect the insect by making it more difficult to wet with the contact spray. The spray for aphids must, therefore, always have a wetter added to it. Various substances have been tried, including oil sprays, and these are often used when scale insects are to be controlled at the same time as the aphids—but for aphids alone there is nothing better than soap. The best form of soap is soft soap, which mixes easily with water. Ordinary yellow soap can be used, but in this case it is necessary to cut it up and dissolve it by boiling it in a little water before adding it to the nicotine solution. Experiments were carried out to ascertain the best quantity of soap to use, and it was found that

2 lb. per 100 gallons of spray mixture gave very good results. If the water used is hard, more soap must be added to neutralize the lime salts in the water, but very hard water should be avoided.

In citrus groves it is sometimes necessary to control mealy bugs by spraying, and often householders are troubled by mealy bugs on their garden plants and pot plants such as ferns. Mealy bugs are closely related to aphids, but are even more heavily coated with wax which protects them from spray materials very effectively. Nicotine is a good insecticide for mealy bugs if it can reach the insects, and in order to help is to do so, we mix it with an oil spray. The oil soaks well into the wax, carrying the nicotine with it.

On citrus trees oil can be used at a strength of 2 per cent., but on delicate plants 1 per cent. of a medium oil spray in water is recommended. Into this is mixed 1 part of 40 per cent. nicotine sulphate to 600 parts of the oil spray mixture. In a four-gallon paraffin tin for delicate pot plants this works out as follows:—

Oil spray: 6·4 fluid ounces or ⅓ pint.
Nicotine sulphate: 1 fluid ounce.
Water to make 4 gallons.

For citrus trees double the quantity of oil spray should be used.

Commercial Tobacco Extracts.

There are various brands of tobacco extract on the market and these usually contain from 7 to 8 per cent. of nicotine or 40 per cent. of nicotine.

To give 0·05 per cent. of nicotine in the spray mixture, the weaker extracts are, therefore, usually diluted at the rate of one part by volume to 100 to 140 parts of water before use.

The stronger 40 per cent, extract is diluted at the rate of one part to 800 parts, but this may vary from 500 to 1,000 according to the species of aphid to be controlled.

An even stronger extract has been used in some countries, and the author experimented some years ago with one that contained 98 per cent. of nicotine. This is almost pure nicotine and is deadly in every respect. When diluted to give the same percentage of nicotine in the spray mixture—that is, by mixing one part with 1,959 parts of water—its toxicity is about the same as that of the other forms.

One of the commonest forms of nicotine on the market in South Africa is nicotine sulphate, which is a chemical compound made be treating the nicotine alkaloid with sulphuric acid. This also contains 40 per cent. of nicotine, and because it is a dark-coloured liquid, is often called " Black leaf Forty ". Its toxicity is about the same as that of the 40 per cent. tobacco extract.

In deciding which form of nicotine to use the cost should be worked out in terms of the actual nicotine bought in the extract. A standard price for nicotine sulphate is about eight shillings per pound, but although this may seem high it is still an economic proposition because of the great dilution at which this 40 per cent. compound is used. In the 7 per cent. extract the actual nicotine at present prices costs about three times as much as when bought in the 40 per cent. nicotine sulphate.

Spraying.

The object in spraying for aphids is to wet the insects, and for this a fine driving spray is necessary. As high a pressure as possible should be used, and the spray should form a fine spreading mist. Disc nozzles are most suitable for this work, and they should be bent at an angle to facilitate spraying under leaves and around stems.

For gardens, a knapsack spray pump is preferred, as it can be used by one man, and plenty of free movement is possible with it. It is important in spraying to keep the nozzle moving. For citrus groves and orchards a power pump is required.

In the case of pot plants, such as ferns, a more thorough method is to fill a wash basin with the correct mixture and then immerse the whole fern in this. Tilt the pot against the edge of the basin and press the fern down into the liquid. Some of the liquid can then be splashed up by hand on to the base of the fern so as to wet the soil and the fronds at their base because this is where mealy bugs often hide. After a few moments the fern should be lifted out and dried in the shade.

Nicotine Dust.

In certain circumstances it is not convenient to use a spray outfit filled with heavy liquid in an orchard or in a vegetable garden, and dusting with a dry powder is easier and quicker.

Nicotine dusts have been developed for use against aphids and are often very effective. Such a dust should contain not less than 2 per cent. by weight of nicotine, and should be finely ground so as to blow over the aphids like a cloud of smoke. Nicotine dusts deteriorate in storage, so that they should be used as soon after manufacture as possible.

A good dust can easily be made on the farm as follows:—

Use good quick lime, and slake it carefully until it forms a fine white powder. Make a sieve from fine brass gauze, such as is used in garages to strain petrol. A good grade having 100 mesh to the inch should be used, and normally can be obtained at about 7s. 6d. per yard. The sifted lime will be fine and soft. Weigh out 50 lb. of this, and put it in an old butter churn or a clean oil-drum with a tight-fitting lid. Add a few round river stones for better mixing, and then add 2 pints of nicotine sulphate. Close the churn or drum tightly, and roll it around for ten minutes. By this time the nicotine will be thoroughly mixed with the lime.

The powder should be separated from the river stones and used as soon as possible. There is not enough liquid in the nicotine sulphate to dampen the powder, and it will still form a fine cloud when blown out of a dusting machine. The bellows type of dusters which give a definite puff with fairly high pressure are best for the spot dusting of aphids but the rotary type is very good for large areas of vegetables.

The weaker tobacco extracts cannot be used for making nicotine dusts, because they contain too much water. All nicotine dusts should be kept in air-tight tins as much as possible. They are light and easy to use, and they are very effective, killing the aphids in a few minutes. Dusting is particularly effective on low-growing plants like vegetables, although in many places it is also used on a large scale on citrus and other fruit trees.

Nursery Quarantines.

The following nursery quanantines were in force on 1 June 1944:—

(1) Beaulieu Nurseries, Forestdale Siding, P.B. Grahamstown, C.P., on citrus (all), for red scale.

(2) Alexander's Nurseries, Lawrence Street, Grahamstown, C.P., on citrus (all), for red scale.

Bolting in Kale.

T. G. la G. Joubert, Department of Genetics, Stellenbosch-Elsenburg College of Agriculture.

KALE (*Brassica oleracia* var. *acephala*) belongs to the cabbage family, and is well-known as an important fodder crop, especially for dairy cows.

It is very closely related to the other well-known members of the cabbage family which are cultivated as vegetables, but is much more resistant to droughts and cold climatic conditions, and can be grown on a large variety of soil types. Two varieties of kale are grown extensively in South Africa, viz., Chou Moellier and Thousand Headed. In this article reference is made only to Chou Moellier.

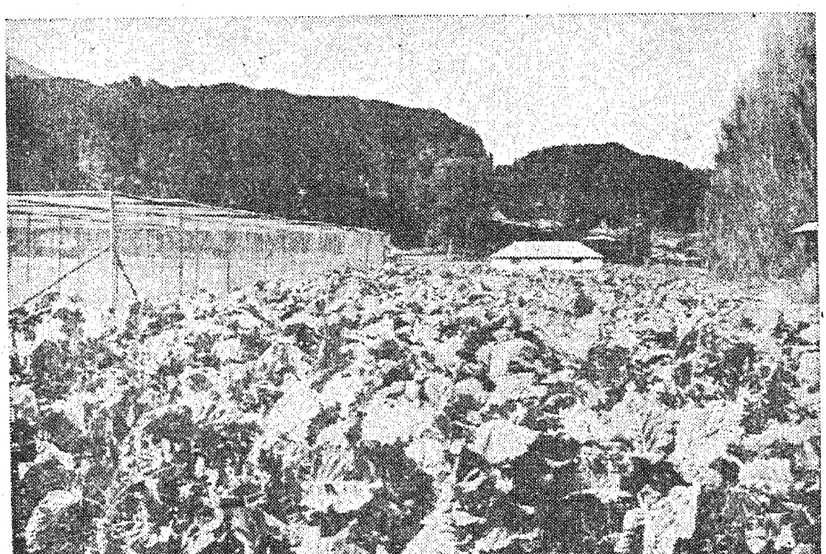

FIG. 1.—A promising patch of young kale. Experiment Station: Welgevallen.

This crop has caused farmers considerable disappointment during the past three years owing to its tendency to bolt and, consequently, to produce a comparatively low leaf crop. The cultivation of kale involves considerable expense, so that a crop failure, results in heavy financial loss. It is therefore of the utmost importance that every effort should be made to eliminate this undesirable characteristic of bolting.

Reasons for Bolting.

Bolting is hereditary in kale, but is influenced to a large extent by environmental conditions, climate playing a particularly important rôle. Cold temperatures promote flowering and running to seed. Consequently, where plants have been subjected to a prolonged period of cold weather during the winter, they usually bolt with the advent of spring.

The question which now involuntarily arises is: Why has so much trouble been experienced in this respect mainly during the past few years? The answer is briefly that the lack of reliable seed has been responsble for all the trouble. In recent years South

Africa has to a large extent been dependent on locally produced seed. This seed is produced from plants which have often not been properly selected, with the result that inferior seed is produced and marketed. Bolters generally yield the largest quantity of seed, and this character therefore becomes more pronounced in each succeeding generation. Many of those who have observed the gradual aggravation of this undesirable character, have begun to think that good kale seed canot be produced in South Africa. This notion is altogether erroneous since there are indications to-day that even imported seed cannot always be relied upon.

Experiments at Stellenbosch.

During 1942 a beginning was made at the Stellenbosch-Elsenburg College of Agriculture with the selection and breeding of kale. Selections were made from stands obtained from seeds of different origin. Towards the end of 1942 seed from these selected plants was harvested on isolated plots. Seed from the various selected

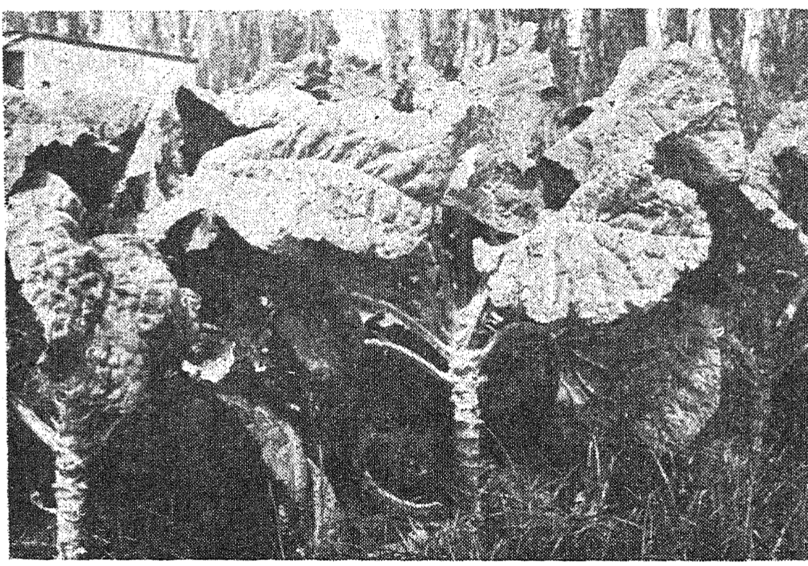

FIG. 2.—Fine kale plants which yield a good leaf crop.

groups was sown simultaneously in 1943, and yielded interesting results.

The progeny of one group, in which a high percentage of bolters occurred in the parent plants, provided evidence that this character was again very pronounced. Some of the plants even started bolting in the seed beds. These young plants form only a few small leaves and then immediately run to seed. A large percentage of plants ran to seed shortly after they had been transplanted. Consequently, where a selection is made from such a poor stand, the progeny also give disappointing results.

The progeny of another selected group showed quite different results. Here the selected plants were taken from a good stand of kale which showed no tendency to bolt.

Even as young plants they proved their superiority over the plants of the first-mentioned group, since they showed no signs of bolting while still in the beds, and on the whole they were also

more vigorous. In 1943 a few morgen were planted to this kale at the Experiment Farm, Welgevallen, and yielded an excellent leaf crop. Only 2 to 3 per cent. of these plants ran to seed after the winter.

High quality seed can be produced only if good plants are selected from a good stand.

Influence of Time of Sowing.

During 1943 observations were also made in regard to the effect of the time of sowing on bolting in kales. Sowings were carried

FIG. 3.—A fine type of kale plant 4½ months after transplanting.

out at three different times, viz., early, normal, and late. The early sowing took place during March. In this case practically all the plants ran to seed after the winter. The normal sowing time was during May. Only a very small percentage of these plants ran to

seed. The late sowing was carried out during September. None of the plants ran to seed and an excellent stand was obtained. (See Figs. 1, 2 and 3.) Seed which had already yielded poor results, was also sown during September. Although some of these plants also ran to seed, the percentage was much smaller than in the case of the earlier sowings.

It would therefore appear that climatic conditions exercise a considerable influence on the hereditary factor or factors for bolting in kale, and for that reason it is recommended that kale seed which might possibly yield doubtful results, should be sown late rather than early. If very little reliance can be placed on the seed, however, the kale will, of course, bolt even when sown at a late planting date.

A fact which is often lost sight of is that kale is a cross-pollinating crop and that pollination is effected mainly by insects. Crossing or hybridization can take place in the following members of the cabbage family:— Ordinary cabbage, cauliflower, savoy cabbage, Brussels sprouts, broccoli, kohl-rabi or turnip-cabbage, curled kale, Couve Tronchuda and Cottager's kale. (Kale does not cross with horse-radish). In order to eliminate this danger of hybridization, kale should therefore be isolated from the above-mentioned cabbage types when the plants start flowering. If this danger is not carefully watched, the plants of the following crop will produce a much poorer yield. It has recently been determined in South Africa that the distance of isolation should be one mile.

A system of inspection and certification of vegetable crops intended for seed purposes is already in operation. Kale does not fall under vegetable crops, and up to the present no arrangements have been made for the inspection and certification of the seed of this crop. Any farmer, however, who has a field of good kale from which he wishes to harvest seed, can enlist the help of the various agricultural institutions which will willingly furnish him with the necessary advice and assistance.

In so far as kale is concerned, the future promises well. It has already been proved *that good seed can be produced in South Africa*. This Institution hopes to build up sufficient quantities of good reliable seed in the near future for distribution among farmers. In future selections will be made which will be better adapted ecologically to meet the requirements of the area.

Meanwhile constant care should be taken to ensure the maintenance of a high standard. Only the very best plants should be selected and the poorer specimens eliminated. Only in that way will we be able to produce good reliable seed.

Diagnosis of Fowl Diseases.

J. D. W. A. Coles, Research Officer, Onderstepoort.

DURING the past few years farmers have sent fowls in ever-increasing numbers to the laboratories of the Division of Veterinary Services at Onderstepoort, and also at Allerton, Pietermaritzburg, for examination and advice. However, in spite of repeated publication of full directions for despatch, etc., the circumstances in which fowls are sent do not allow the greatest benefit to be derived from the examination.

Some farmers omit to write a covering letter, and frequently leave it to officials to guess their names. Others merely send a couple of lines notifying the Department that some fowls have been sent, and the examining officers are left to imagine all the interesting details that the farmer could have furnished. Then there is the person who sends big live chickens a long distance in a shoe-box without food or water, and such unintentional cruelty is not pleasant to encounter.

Fortunately, the examination of poultry in the Government laboratories has not yet descended to a mere matter of routine. The officials concerned endeavour to make every case an interesting one, and so satisfy their own intellects as well as the farmer's. This desirable state of affairs is possible only with the whole-hearted support of each individual farmer, and the following remarks indicate how this collaboration can be achieved.

Live Sick Fowls better for Examination.

Experience has shown that live sick fowls are more satisfactory for examination than dead ones. However, the expense of railage used to be a formidable obstacle, so regulations have been approved which permit crates of live sick fowls being sent carriage forward, while dead fowls must still be sent carriage paid. It matters little if one or two die on the journey, for they usually arrive in a satisfactory condition for examination.

The fowls must be sent in fairly substantial crates containing food and water receptacles that cannot be overturned. If the journey to be travelled is a long one, a bag of food should be tied on the outside of the crate so that railway officials can feed the fowls *en route*. The Department cannot undertake to return crates or poultry owing to the danger of spreading infectious diseases. The best way to send a dead fowl is merely to wrap it in a piece of hessian. Preservatives should on no account be used, as they interfere with the examination. There is no reason, however, why formalin or some other repellent should not be sprinkled over the fowl, to keep off flies. Day-old chicks can be sent in the ordinary ventilated boxes without food or water. Poultry, dead or alive, should be sent to the Onderstepoort Laboratories, Pretoria North Station, or to the Allerton Laboratory, Victoria Station, Pietermaritzburg.

A Fully Descriptive Letter Necessary.

Having despatched the birds, the farmer should write a fully descriptive letter stating, *inter alia*—

(1) the number of chicks as well as adult poultry kept;

(2) the number of deaths, and at what intervals they have occurred;

(3) the various species of poultry kept;

(4) the housing conditions;

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(2) the number of deaths, and at what intervals they have occurred;

(3) the various species of poultry kept;

(4) the housing conditions;

(5) what the diet consisted of—please do not presume that the officials know the composition of every mash which the farmer may feel inclined to mention only by name, but give the formula, stating how much of each ingredient is incorporated;

(6) the temperature records of the incubator as well as of the brooder house;

(7) the amount of floor space (in square feet) allowed for each bird;

(8) details regarding the egg production;

(9) the incidence of tampans, fleas, lice, worms and the little black flies that get between the feathers under the abdomen and suck blood;

(10) the symptoms; (The thermometer should be inserted in the vent. Do not try to interpret symptoms, e.g., instead of saying that the fowl had diarrhoea, say the droppings were very watery and yellowish green, and smelt badly; instead of saying the fowl was blind, say the lids were stuck together over the eye, or that over a period of months the reddish-brown part of the eye had gradually turned grey till the fowl could no longer see out of that eye. A simple, straightforward account of the symptoms does not include a farmer's thoughts and deductions, but only a plain description of what he has ascertained by using only his eyes, nose, ears and hands.)

(11) the post-mortem appearances of fowls the farmer has opened; (Describe carefully all deviations from the normal.)

(12) the previous history of poultry disease on the farm, and also details regarding any inoculations.

If letters with full information are written and fowls are forwarded in the manner described, a diagnosis satisfactory to both the farmer and the examiner will be possible, and then only can the best available advice be given.

Replies are usually ready within a week, but in exceptional cases a diagnosis cannot be given with certainty in less than a fortnight in view of essential tests, etc., that have to be carried out.

The Freezing Point of Milk:— [Continued from page 424.

$-0{\cdot}524$ to $-0{\cdot}555°$ C., with a fall towards the end of the lactation period of the cows. The average freezing-point was $-0{\cdot}541°$ C., which coincides exactly with the figure determined by other workers in South Africa, and it also coincides with the average obtained by workers in other countries. This work thus confirms the value of the figure ($-0{\cdot}541°$ C.), which is used as the freezing point of milk in South Africa.

By means of the following formula the freezing-point ($-0{\cdot}541°$ C.) is used to determine the percentage of water added to milk:—

$$W = \frac{100\,(T-T_1)}{T}\,\%.$$

Where W is the percentage of added water, $T = {\cdot}541$ and $T_1 =$ the freezing-point of the sample which is being tested.

(Agricultural Research Institute.)

Preparation of Casein on the Farm.

G. Vaandrager, Dairy Officer, Department of Agriculture and Forestry.

WHEN skimmed milk is thickened, as for instance by allowing it to turn sour, a greenish fluid called whey is obtained, while the coagulated portion is known as curd which consists mainly of casein.

Casein plays an important rôle in the making of cheese—hence the name. It is also of great value in human and animal nutrition. In the industrial field casein is also used for a great variety of purposes, as for example, in the manufacture of artifiicial bone, buttons, knife handles, different kinds of paint, paper, etc., as well as in the preparation of cold-water glue or casein cement and many other substances.

At present there is a good demand for industrial crude casein. In the past a considerable part of the casein used in this country was imported from overseas, but there is no reason why we should not in future be able to produce our own casein requirements. In South-West Africa a considerable amount of casein is already being made on farms, and much of this is of excellent quality.

Skimmed Milk on the Farm.

Skimmed milk is a by-product on the farm, and is generally used for feeding humans, calves, pigs and fowls. The available quantity of skimmed milk varies with the different seasons; if there is an adequate supply for pigs in winter, there is usually a surplus in summer. At the moment some farmers have a surplus of skimmed milk, but cannot obtain any pigs to consume all this milk. The preparation of crude casein therefore provides such farmers with an excellent opportunity of converting a surplus by-product into a useful substance.

Principles of the Process.

The principles involved in the preparation of crude casein may be briefly summarized as follows: The skimmed milk is first allowed to turn sour and thicken; the curd is then broken up and separated from the whey. The following step is to wash the casein by the addition of water; a low acid content has an important influence on the quality of the final product. The curd is then pressed and dried. One hundred gallons of skimmed milk will yield between 32 and 35 lb. of casein, and the price for the best quality is 5½d. per lb., while that of medium quality is 4½d. per lb. Buyers pay the transport costs, and names and addresses are obtainable on request from the Superintendent of Dairying, P.B., Pretoria.

Method of Preparation.

Casein can easily be made on the farm, and the best results are obtained when the following instructions are very carefully followed. All superfluous, fresh, skimmed milk is collected in suitable drums or basins and left to thicken and turn sour. Thickening can be accelerated by the addition of from 5 to 10 per cent. sour whey of the previous day. The milk should show the first signs of coagulation at the bottom of the basin within 3 to 4 hours. If the milk becomes too sour, the casein will be of inferior quality. The best time for breaking up and stirring the curd is as soon as possible after the milk has turned quite thick. It should not, for instance, be left to stand overnight.

Sufficient boiling water is added now to bring the temperature up to 100° or 110° F., whilst the milk is slowly stirred with a wooden rake. This method has the disadvantage of diluting the whey, but the advantage that no special jacketed container is required.

As soon as the whey has a light green colour and the curd has been broken up into small pieces, stirring should cease in order that it can sink to the bottom of the container. Now as much of the whey as possible is siphoned off or scooped out with a bucket. If the container is very full, some of the whey can be scooped out to make room for the boiling water. It is advisable to strain the whey, and sufficient must be kept for the following day.

Clean cold water is then added until its height in the container is 6 inches above the level of the curd, which is now well stirred again to wash it. After this water has been drawn off, the curd is washed in clean water a second time.

When the second washing water has been siphoned off, the curd is taken out and placed in clean bags or cloths in order to squeeze out as much of the water as possible. It is then left to stand overnight with weights on top, and by the next morning will have been compressed into a single mass. It is now broken up by hand into fairly large pieces, which are rubbed through a sieve. A convenient size for the sieve is about 18 to 24 inches square; the wires must be strong and ¼ inch apart. The curd is now spread in a thin layer on corrugated iron sheets or on wire-netting frames (½-inch mesh) covered with cheese cloth, hessian or any similar material. A convenient size for the frames is 6 by 3 ft.; a cement surface is unsuitable.

The frames, etc., are placed in the sun and the curd is stirred well several times, when it begins to become wind-dry. As soon as the casein is quite dry and begins to assume a horny appearance, it should be taken out of the sun, because if it is exposed to strong light too long, it acquires an undesirable brown colour.

The casein is now ready for packing into bags for despatch to buyers. The bags should be kept in a dry, cool place since the casein may be damaged by water.

Transmission of Horse-sickness and Blue-tongue in South Africa:—

[*Continued from page* 423.

such as to justify the conclusion that one or more species of *Culicoides* are capable of transmitting blue-tongue to sheep. Furthermore, the results obtained by the injections of *Culicoides* caught in the wild state during March and April strongly suggest that these insects are probably involved in the transmission of horse-sickness as well.

In conclusion, it may be pointed out that this investigation has been very instructive in revealing a surprising abundance of these small blood-sucking midges of the genus *Culicoides* at night in an area where some had hitherto been known to occur, but assumed to occur only in relatively small numbers. The demonstration of the presence of the viruses in the insects during the late summer months conforms closely with the knowledge of the occurrence of these two diseases acquired by careful observation over many years. In addition, the experimental work has added yet another group of insects to the list of known transmitters of virus diseases, and the hope is expressed that the subsequent work in regard to these problems may be productive of methods of practical value in the control and ultimate eradication of horse-sickness and blue-tongue.

Nagana in Zululand.

E. B. Kluge, Nagana Research Officer, Zululand, and R. du Toit, Veterinary Research Officer, Onderstepoort.

THE disease nagana may be described as a chronic, rarely acute, wasting disease of domestic animals which is caused by a minute blood parasite known as a trypanosome. The more general term trypanosomiasis applies to the disease as observed both in our domesticated animals, as well as in the notorious sleeping sickness of man in Central Africa.

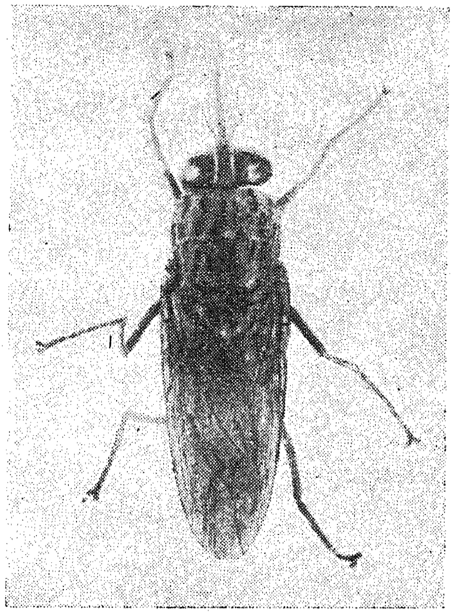

FIG. 1.—*Glossina pallidipes.* Enlarged 4 times.

To farmers in the tsetse-fly infested areas of Zululand the disease requires little introduction, as it has been responsible from time to time for disastrous losses amongst livestock in the settlement areas, as well as in the native reserves.

In order to understand the nature of the disease, it is necessary to describe the methods of treatment applied, the control measures advocated, and the mode of transmission, and to give a brief description of the life cycle and habits of the tsetse flies which transmit it.

The Transmitters.

There are about 19 species of tsetse flies known to-day which are confined to the tropical and sub-tropical portions of Africa, except for one species which is known to occur in the southern tip of Arabia. These flies all belong to the single group or genus, *Glossina*, and may be described as medium to large flies predominantly yellowish to brown in colour, which have a prominent proboscis entirely covered by a pair of palps protruding forwards from the under surface of the head. In the resting position the wings are folded flat over the abdomen which they conceal entirely, and they have been likened to the closed blades of a pair of scissors.

In Zululand 3 species only are known to occur, viz., *Glossina pallidipes*, found in the Umfolozi Game Reserve, *G. brevipalpis* and *G. pallidipes* in the Hluhluwe Game Reserve, *G. pallidipes* and *G. austeni* in the Mkuzi Game Reserve ,and *G. brevipalpis* alone in the Nduma Game Reserve.

Habits and Life Cycle of Tsetse Flies.

Tsetse flies are confined to what are known as fly belts, the limits of which are controlled by various factors such as vegetation and shade, the presence of suitable hosts, moisture and altitude. All depend entirely upon the blood of vertebrates for food, but differ in their habits in proportion to the degree or intensity of the climatic requirements of the various species. Thus *Glossina pallidipes* (Fig. 1) which is the dominant species in Zululand, prefers more light and can maintain itself under very much drier conditions than *Glossina brevipalpis*. The former species is encountered in the more or less open type of savannah, and is active during bright sunlight except during the hottest hours of the day, whereas the latter is typically a species of the deep shade of valleys and riverine thickets and is active in the subdued light of evening and very early morning.

In comparison with most other insects, tsetse flies have a very low rate of reproduction. The female is viviparous and produces a full grown larva at intervals of 10 days or longer, depending on the available food supply. The larva is a whitish oval body, roughly $\frac{1}{4}$ inch in length with two knoblike prominences at the hind end, and is deposited in a sheltered spot on ground rich in humus in bush thickets or under the low dense canopy of a single bush. It is feebly active and immediately burrows its way into the loose soil to a depth of up to $1\frac{1}{2}$ inches where, by a process of hardening and darkening and some shrinkage, the pupa is formed within 1 to 3 hours. The pupa is dark brown or black and barrel-shaped with two prominent knoblike projections at one end, and the pupal period occupies from 15 to 70 days depending upon climatic conditions.

It is estimated that during her life a female tsetse fly can produce from 10 to 15 larvae with an average of approximately 12.

The Mode of Transmission of Nagana.

The nagana parasite or trypanosome, three of which are distinguished in the Union, namely, *Trypanosoma brucei*, *T. congolense* (Fig. 2) and *T. vivax*, normally infects various species of game animals which suffer no ill effects as a result of these infections. The tsetse fly, which is solely dependent upon blood for its food supply, acquires the infection from game during the act of biting. The trypanosomes so ingested undergo a period of development in the proboscis, salivary glands or gut of the fly, depending upon the species, and after this developmental period the fly is capable of transmitting the infection to susceptible animals. Once infected, a tsetse fly retains the infection probably for the duration of its life and is capable of infecting a large number of animals. This appears to be especially true in the case of *G. pallidipes* which, due to interrupted feeds, may infect several animals during the course of attempting to obtain a single blood meal.

Control Measures.

In order to embark upon a campaign for the eradication of tsetse flies with a reasonable chance of success, a thorough knowledge of the life cycle and habits of the species to be dealt with is necessary. Much intensive research in this respect has been undertaken, both in Zululand and in the fly-infested areas of Africa in

general, and attempts at destruction have been aimed directly at the flies in both the adult and immature stages and indirectly at the food supply and the environment.

1. The Direct Attack upon Tsetse Flies.

(*a*) *Larval and pupal traps*.—The small measure of success attained by attempts to induce tsetse flies to deposit their larvae in certain places, designed to be particularly attractive and in which the pupae are destroyed from time to time, calls for little comment. Suffice it to say that for a species such as *G. pallidipes*, which deposits its larvae over extensive areas and under a wide range of conditions, the method has met with no measurable success.

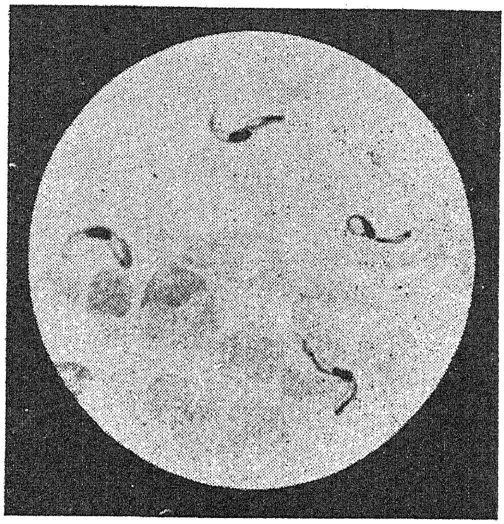

FIG. 2.—*Trypanosoma congolense* in blood. Enlarged 1,300 times.

(*b*) *Trapping of Adult Flies*.—The comparatively slow rate of reproduction of tsetse flies suggests that effective trapping on a large scale may offer a means of controlling the fly. A great many designs of traps have been tested throughout Africa, and in the game reserves of Zululand the Harris Trap has been used very extensively, where it has been responsible for the destruction of large numbers of flies. During the dry years of 1933 to 1935 it appeared as if it would succeed in reducing the flies to a level where they would perhaps be unable to maintain themselves, but with the advent of the wetter years that followed, it was realized that the flies were again increasing in numbers in spite of an average catch of 150,000 flies per month.

2. Indirect Methods of Attack.

(*a*) *Game Eradication*.—Experience has shown that by depriving the fly of its food supply, marked reduction and even elimination of tsetse flies is possible. In nature the normal food supply of the tsetse fly consists of the various species of game, although it must be mentioned that the fly is quite capable, theoretically, of maintaining itself upon the blood of cattle and other domesticated animals as long as they are present. Investigations have shown that a comparatively low density of game is capable of maintaining a high density of fly, and this may be accounted for by the sensitive and accurate sense possessed by the tsetse fly which guides it to its food

supply. To be effective, therefore, complete eradication of game is necessary, and this should be undertaken systematically by organized shooting, trapping, etc., commencing at the periphery of the fly belt and working inwards to prevent scattering of the game and consequent dispersion of the flies. In settlement areas it cannot be over-emphasized that elimination of the smaller species of game such as bushbuck, reedbuck, duiker, steenbuck, klipspringer, warthog and bushpig should be carried out as expeditiously as possible to reduce the source of infection and the food supply of the fly before it can adapt itself to subsisting on domesticated animals.

(*b*) *Bush Clearing.*—The objects aimed at in bush clearing are twofold and comprise:

(i) the disturbance of the climatic requirements of the fly in its breeding haunts, and

(ii) the limitation of the spread or dispersion of the fly from its primary focus.

In the first place, selective clearing of certain types of vegetation favoured by the fly for breeding purposes particularly is undertaken, whereas in the second place complete eradication of all trees and bush in the form of a barrier or strip-clearing is aimed at. To be effective, such barrier clearings are situated at the periphery of a fly belt near the normal limit of dispersion of the fly and should be at least half a mile wide and free of all game or stock.

(*c*) *Grass Burning.*—In conjunction with bush clearing, properly controlled grass burning is of great value. Not only will the burning of a good stand of dry grass assist materially in the eradication of encroaching bush, but for a certain period unfavourable conditions will be created for the fly by the elimination of cover in the form of grass and thicket shelter so essential for its existence.

Nagana in Domesticated Animals.

In contradistinction to game animals, which show no ill effects from the presence of trypanosomes in their blood and therefore act as carriers of the disease, domesticated animals are severely affected. Of the three species of trypanosomes mentioned, *Trypanosoma vivax* and *T. congolense* play the most important part in Zululand, which is essentially a cattle country, as these are cattle trypanosomes. *T. brucei* is more typically an infection of horses and dogs, although *T. congolense* is by no means uncommon, particularly in donkeys.

After having been bitten by an infected fly, disease symptoms appear within a period of from two to four weeks or longer, depending upon the condition of the animals, the season and the nature of the grazing. Symptoms are always more pronounced in the winter months when the grazing is poor as a rule, and consist of progressive emaciation with a staring coat, intermittent temperature, diarrhoea, drooping ears, watering eyes, disinclination to face strong light and a capricious and abnormal appetite. This latter frequently manifests itself by cattle eating soil such as that of antheaps. The lymphatic glands are swollen, the gland at the point of the shoulder being particularly noticeable. Similar symptoms are observed in horses, but in addition dropsical swellings are common on the legs and undersurface of the belly and chest. In dogs eye-symptoms are frequent which often lead to blindness.

Diagnosis.—The recognition of the disease is generally not difficult, but it may be confused with other debilitating conditions such as worm infections and should therefore always be confirmed by demonstration of the causal organism microscopically. *T. vivax*

generally gives rise to chronic infections in cattle where the organisms are not always readily apparent in blood smears. It is advisable, therefore, to puncture an enlarged lymphatic gland by means of a hollow injection needle and to make a smear from the material contained within the needle upon withdrawal. *T. congolense*, on the other hand, is more virulent for cattle as a rule, and the disease frequently takes a subacute or even acute course in which case it is difficult to distinguish from other acute infections. Blood-smear examination generally affords a ready method of diagnosis, but spleen smears are not satisfactory. Mixed infections of *T. congolense* and *T. vivax* are not at all uncommon and generally run a subacute course.

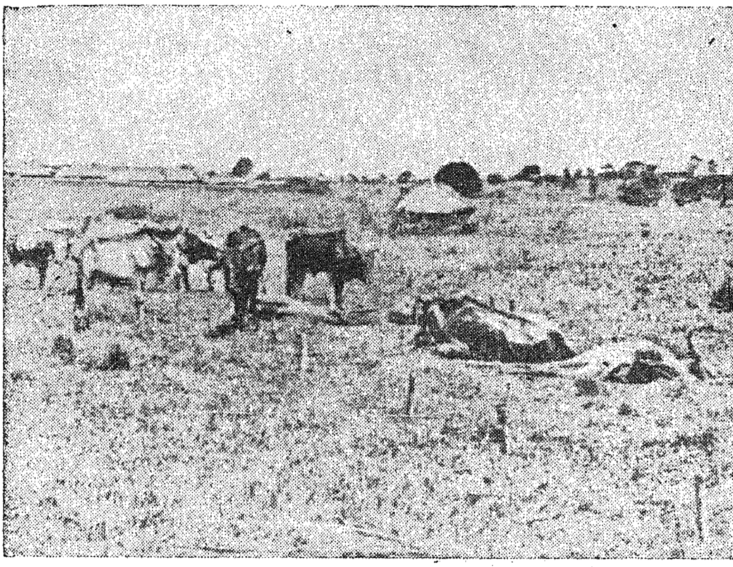

FIG. 3.—Group of cattle in the last stages of Nagana.

Treatment.

A great many different drugs have been tested for the treatment of nagana, but those which have consistently given the best results are potassium antimony tartrate (tartar emetic) and Antimosan (a proprietary preparation) in the case of cattle infected with *T. congolense* or *T. vivax*, or both, and Naganol (proprietary) in the case of *T. brucei* infections in horses and dogs.

Tartar emetic is particularly effective against *T. congolense*, whereas Antimosan has been found to yield the best results against *T. vivax*. Many methods of treatment with these drugs have been adopted, and in various parts of Africa the intervals at which injections are applied, vary considerably. In general it may be stated that the ideal to be aimed at should be the rapid elimination of the infection from a herd by energetic short-interval injections. The object is twofold, as not only does such rapid sterilization of animals reduce the infection and consequently the chance of infecting previously uninfected tsetse flies, but trypanosomes have the faculty of developing a tolerance or so-called drug fastness to drugs applied over long periods in small doses, and chronic infections may result which may ultimately fail to respond to treatment.

Tartar emetic is only sparingly soluble in hot water and relatively insoluble in cold water. Stock solutions of the drug are not practical, as no constant concentration can be maintained and this varies according to the temperature of the water. The drug should be dissolved in boiling water prior to use, and the solution allowed to cool to blood heat before injecting.

Dosage.—The dose recommended for adult cattle is 1 to 1·5 gm. dissolved in 20 to 30 c.c. of water. For very weak and undernourished animals and for young stock this dose may be reduced accordingly.

Method of Injecting Tartar Emetic.

Tartar emetic must be injected directly into the bloodstream, as it is extremely irritating when injected under the skin. Large painful swellings, frequently giving rise to abscesses, result when due to errors in injection, the drug is introduced into the subcutaneous tissues.

Animals to be injected should be well controlled in crushes or preferably by casting. Pressure is applied to the jugular vein by means of a cord drawn tightly round the neck close to the chest. This constriction prohibits the flow of blood towards the heart in the jugular vein which consequently swells and may be seen easily as a thick cordlike prominence towards the lower surface of the neck. A hollow injection needle is inserted into the distended vein and the blood allowed to flow through it for a few seconds. The syringe, which has previously been filled, is applied to the needle and the pressure on the jugular vein released by relaxing the cord. The injection should be made slowly, as too rapid an injection may produce shock, and even death may result. When this operation has been completed, pressure is again applied to the jugular vein and the syringe removed, leaving the needle in position. Blood is allowed to flow through the needle for a few seconds to remove all traces of tartar emetic, and the cord is then removed from the neck and simultaneously the needle is withdrawn.

In the case of Antimosan, administration is greatly simplified as this drug may be injected subcutaneously. Unfortunately, this drug is extremely difficult to obtain at present and reliance must therefore be placed upon tartar emetic.

Methods of Treatment Recommended.

(1) As a routine procedure for cattle, 5 injections of from 1 to 1·5 gm. of tartar emetic in 20 to 30 c.c. water for adult cattle on consecutive days have been found to give very good results. If properly carried out it is very seldom necessary to repeat the treatment, but it must be borne in mind that cattle may become reinfected almost immediately after treatment.

(2) Where Antimosan is available, the use of this drug together with tartar emetic is highly effective, particularly where both *T. congolense* and *T. vivax* occur simultaneously in a herd.

To start with, 1·5 gm. of tartar emetic in 20 c.c. water are given intravenously, followed on the next day by a subcutaneous injection of 30 c.c. of the 7 per cent. solution of Antimosan or 15 c.c. of the 12 per cent. solution. On the third day a final injection of 1·5 gm. tartar emetic is given.

(3) Where Antimosan is used alone, 40 c.c. of the 7 per cent. solution or 25 c.c. of the 12 per cent. solution are injected subcu-

taneously as a single injection. This treatment should be repeated at least once after an interval of 8 days.

(4) In the case of horses, mules, donkeys and dogs, where the trypanosome *T. brucei* is generally responsible, the drug Naganol is used. The dose for horses is 1·5 gm. of Naganol dissolved in 20 c.c. boiled water, and this is injected into the jugular vein at monthly intervals, two injections generally sufficing.

For donkeys the dose is reduced accordingly, and in the case of dogs should not exceed 0·25 gm. of Naganol.

(5) Where equines are infected with *T. congolense*, 1 gm. of tartar emetic in 20 c.c. water is given at weekly intervals. In the case of dogs, *T. congolense* infections are best treated with Antimosan at the rate of 0·03 gm. per Kilogram (2·2 lb.) live weight, administered subcutaneously. One injection generally suffices.

In view of the present scarcity of Antimosan it is recommended that the use of this drug for cattle be confined to the combined tartar emetic-Antimosan treatment recommended in (2) above.

General Considerations.

For any of the above methods of treatment to be effective, it is essential that great care be exercised in administering the correct dose of the drug or drugs used and that injections be carried out in the manner described. Difficulties will be encountered occasionally with the use of tartar emetic alone in the treatment of chronic cases of nagana caused by *T. vivax*. In such cases recourse must be had to Antimosan.

Furthermore, it must be borne in mind that the methods of treatment outlined above are designed to eliminate the infection of trypanosomes from infected animals entirely and that such "sterilized" animals are subject to reinfection almost immediately. Where reinfections occur, generally noticeable after 2 to 3 weeks or longer, the complete course of treatment should be repeated.

In addition to drug treatment the proper care of treated animals has a profound effect in ultimate recovery, and such animals should be herded separately in order that special attention may be paid to them. Where possible, they should be kept away from bush thickets and valleys favoured by tsetse flies, as such emaciated animals are particularly subject to attack.

To enable farmers to determine the correct dosage of tartar emetic for injection purposes, it may be stated for general information that the dosing-spoon, marked No. 0, included in the set of spoons used for administering the Government Nodular-Worm Remedy, holds approximately 1·5 gm. tartar emetic when filled and scraped off level. These spoons may be obtained from the Director of Veterinary Services, P.O. Onderstepoort, at 7d. each.

It will be readily appreciated from the above discussion of the various phases of the nagana problem in Zululand that to achieve success in the final elimination of tsetse flies from the country, team work is necessary, which calls for the whole-hearted co-operation of all those concerned in the potential nagana areas in rendering conditions unsuitable for the tsetse fly by diligent application of all the various methods outlined.

Irrigation Experiments with Citrus Trees in the Sunday's River Valley.

I. Mathews, Officer-in-Charge, Citrus Research Station, Addo.

IN view of the alkaline nature of citrus soils in the Sunday's River Valley, and the salinity of the irrigation water used, the successful production of citrus fruits in this area is intimately associated with soil moisture and irrigation practices. The general principles underlying the correct use of irrigation water in citrus orchards have been clearly outlined by Theron (1), whose studies have been of outstanding value to growers in the Valley. By means of the basin system of irrigation for the control of both quantity of water applied and penetration, and a water supply not exceeding some 200 p.p.m. in chlorine, many groves were undoubtedly saved from complete extinction. There can be no question that the "calendar-system" of irrigation as practised in the Valley militates seriously against the most efficient type of irrigation and soil moisture control; nevertheless, the application of the principles outlined by Theron has definitely averted a major catastrophe to most citrus growers in this important citrus area.

While the more important aspects of irrigation and soil moisture control have been satisfactorily elucidated, certain problems of a more or less specific nature are encountered, which may, or may not be, associated with soil moisture. Of these, low soluble solids and the so-called "puffiness" of the fruit are undoubtedly the most important. In many orchards the fruit fail to reach the required minimum percentage of soluble solids (i.e. 9 per cent.) at maturity. "Puffiness" as used in this article is a general term referring to weak-skinned fruit, and is really a "creasing" of the rind. Such fruit is of satisfactory internal quality, but very subject to splitting and subsequent wastage when slight pressure is exerted on the packed case, and hence worthless from the commercial point of view. In many orchards as much as 50 per cent. of the crop may become affected, resulting in a total loss to the grower.

Irrigations applied.

In order to ascertain whether the application of varying quantities of irrigation water bears any relation to these phenomena, an irrigation experiment was laid out on the property of Messrs. Willowtree Jerseys (Pty.) Ltd., in August 1936. The orchard consists of fairly uniform Valencia trees planted in 1924 on a well-drained, alluvial loam soil. Based largely on the results reported by Theron (1), the following treatments were applied:—

I. Irrigation when the trees show the first signs of permanent wilting, applying three inches of water.

II. Irrigation at each scheduled irrigation, i.e. about 4-weekly intervals during summer (provided such scheduled irrigation is actually delivered), applying three inches of water.

III. Same as II, but applying 4½ inches of water.

The complete basin-system, employing a single large basin around each tree, was used, and the amounts of water used were carefully measured. Water in a storage dam was used when necessary, for treatment I. The three treatments were replicated five times in separate blocks according to the randomized block system; each plot consisted of twelve trees, i.e. a total of 60 data trees per treatment. Soil samples were taken at regular intervals around the data

trees in order to study the moisture relations under each treatment (Prior to the commencement of the experiment, the orchard was irrigated by means of the " furrow method ". Soil-moisture studies revealed that the penetration of water was on the whole very poor; in many cases the second and third foot layers received insufficient moisture.)

In this particular experiment the aim was to have three " moisture levels ", viz. (*a*) under-irrigation (treatment I), (*b*) over-irrigation (treatment III), (*c*) medium or more or less optimum amounts of water (treatment II). In this connection the results of Theron (1) were taken as a guide. According to this investigator, approximately 32 inches of water are required per annum to mature a normal citrus crop under conditions of reasonably clean cultivation. The amounts of water applied annually in inches (irrigation plus effective rainfall, i.e. a precipitation of 0·5 inches or more) over a period of four years in the different treatments were as follows:—

Years.	Treatment I.	Treatment II.	Treatment III.
1936–37	21·7	30·7	40·2
1937–38	21·3	29·3	38·3
1938–39	22·7	31·7	40·7
1939–40	23·4	29·4	36·9
Average for 4 years	22·3	30·3	39·0

In December 1940, it was decided, in view of general observations on the condition of the trees as well as the yield records (to be presented later) over the period of four years, to introduce the following modifications in the experiment:—

Treatment I.—A four-inch irrigation at the first signs of permanent wilting instead of three inches. This change was made in view of the rapid deterioration in tree condition (defoliation, etc.) and the yields (*cf.* 1941 results). Furthermore, soil moisture studies revealed that, with a three-inch irrigation at wilting, penetration of water was seldom deeper than three feet. (In view of a serious water shortage in June 1941, it was not possible to apply more than two inches of water instead of four.)

Treatment II.—A two-inch irrigation instead of three inches at each scheduled irrigation. This modification was introduced so as to obtain a bigger variation in moisture content between treatments II and III. The soil moisture studies had up to this stage revealed little, if any, differences between these two treatments.

For comparative purposes, the results obtained for the 1941 season have been tabulated with those of the previous four years, although they were analysed separately for significance of the values recorded. Unfortunately, the heavy rains and floods experienced during October 1941 caused such a silting-up of this grove that it was impossible to carry on with this trial. It was therefore discontinued and the results obtained over the five year period 1936-1941, including the modifications introduced in 1940, are herewith presented.

(*a*) Influence on Yields and " Puffiness ".

Yield records were taken annually of all data trees as from 1937 and are given in Table 1 as the average weight of fruit in lb. per tree.

[*Note.*—For 1937, the first complete year of the experiment, yield records were taken for only two data trees per plot (i.e. a total of 10 per treatment), and hence cannot be regarded as a true average.]

TABLE 1.—*Average weight of fruit (lb. per tree) for different treatments.*

Year.	Treatment I.	Treatment II.	Treatment III.
1937	213	214	285
1938	362	344	379
1939	255	300	315
1940	244	254	254
Average	287	299	316
1941	196	299	317

Statistical analysis shows no significant differences between the various treatments for the 1937, 1938 and 1940 crops, no doubt due to good effective rains during July to November over these three years. For the 1939 crop, Treatment I is significantly lower than Treatments II and III, although no significance can be shown between Treatments II and III. The same applies to the 1941 yields, where the decline in yield of Treatment I is especially noteworthy.

Effect of Irrigation on "Creasing" or "Puffiness".—This particular orchard showed a fairly high percentage of "puffiness" for a number of years prior to the commencement of the experiment, and was therefore well suited for this investigation. At harvesting time the fruit from all plot trees (i.e. 60 per treatment) were graded into "normal" and "puffy", and weighed separately. The percentage by weight of "puffy" fruits found in the various treatments is given in Table 2.

TABLE 2.—*Percentage by weight of "puffy" fruit in various treatments.*

Years.	Treatment I.	Treatment II.	Treatment III.
1937	7·4	1·4	2·1
1938	2·3	0·4	0·3
1939	10·3	4·7	3·2
1940	9·6	5·0	4·3
Average	7·4	2·8	2·5
1941	6·6	4·0	1·9

For the seasons 1937 to 1940 the percentage of "puffy" fruits is significantly higher in Treatment I than in Treatments II and III. This also applies to the 1941 results, where both treatments I and II give significantly greater percentages of "puffy" fruits than treatment III. These results indicate that the amount and frequency of irrigation have an influence, either directly or indirectly, on the problem of "creasing". Field observations over a number of years also support this view: most "creasing" has been noticed in orchards which were allowed to wilt between irrigations.

(b) Influence of Different Treatments on Fruit Quality.

At harvesting time eight fruits (size 252) were taken from each data tree and a composite sampe of 16 used for quality tests (juice,

soluble solids, acid and ratio of soluble solids to acid). The results obtained are given in Tables 3, 4, 5 and 6.

TABLE 3.—*Percentage of juice for different treatments.*

Years.	Treatment I.	Treatment II.	Treatment III.
1937	55·1	54·5	56·3
1938	55·4	52·0	56·0
1939	53·5	53·5	53·0
1940	53·0	54·0	52·0
Average	54·4	53·5	54·3
1941	54·2	52·5	53·9

The various treatments apparently had no influence on the juice content of the fruit. It was noted, however, that the fruits of Treatment I were smoother, firmer, and in general more attractive in appearance as compared to Treatments II and III, the fruit of which were fairly coarse with very large oil glands in the rind. On the other hand, the fruit of Treatments II and III were decidedly less "raggy" or tough than those of Treatment I.

TABLE 4.—*Influence of irrigation on soluble solids (percentage).*

Year.	Treatment I.	Treatment II.	Treatment III.
1937	12·2	11·6	11·1
1938	10·7	9·7	9·2
1939	10·9	9·3	9·2
1940	11·1	10·5	10·3
Average	11·1	10·3	9·9
1941	12·3	11·0	11·0

The percentage of soluble solids is significantly higher for of which were fairly course with very large oil glands in the rind. difference exists between the latter two treatments. There is, however, a tendency towards a lower soluble solids content in Treatment III as against Treatment II. The 1941 results follow the same trend. It appears therefore than an inverse relation exists between the soluble solids content of the fruit and the amount of irrigation water applied. Whether this effect is due directly to the amount of irrigation water applied, or indirectly to nutritional relationships, cannot be ascertained at this stage. From the practical point of view, this result has been of the utmost importance as regards fruit quality. In many cases where growers experienced difficulties with low soluble solids, remarkable improvements were obtained with both Navels and Valencias, simply by reducing the amount of irrigation water applied.

TABLE 5.—*Influence of irrigation on acid content of fruit (as per cent.).*

Year.	Treatment I.	Treatment II.	Treatment III.
1937	1·5	1·3	1·3
1938	1·7	1·4	1·4
1939	1·4	1·2	1·1
1940	1·5	1·3	1·3
Average	1·5	1·3	1·3
1941	1·1	1·0	1·0

Over the four-year period 1937-1940, consistent and significant differences in acid content exist between Treatment I as compared to Treatments II and III, while there are no differences between Treatments II and III. For the 1941 season the acid content of Treatment I is slightly higher than the others, but the differences are not significant. In general it appears that the same indirect relationship exists between acid content and amount of water applied as was found with the content of soluble solids. The influence of irrigation on acid content is, however, not of the same importance with respect to fruit quality as is the case with the soluble solids content of the fruit.

TABLE 6.—*Influence of treatments on the ratio of soluble solids to acid.*

Year.	Treatment I.	Treatment II.	Treatment III.
1937	8·4 : 1	8·9 : 1	8·8 : 1
1938	6·5 : 1	6·8 : 1	6·4 : 1
1939	6·7 : 1	7·8 : 1	7·9 : 1
1940	7·6 : 1	7·9 : 1	8·0 : 1
Average	7·5 : 1	7·8 : 1	7·8 : 1
1941	11·2 : 1	11·1 : 1	11·2 : 1

The seasonal variation in the ratio of soluble solids to acid is more pronounced than that found for soluble solids and acid individually; at the same time, however, the differences are not significant. This is explained by the positive correlation which exists between the percentages of soluble solids and acid in the fruit. There is a general tendency towards a lower ratio in the fruit of Treatment I as compared to that of the other two treatments. At the same time it must be added that the fruit of Treatment I was more highly flavoured, but took somewhat longer to reach the required ratio of 6:1 than that of Treatments II and III. In addition, the rind of fruit from Treatment I was thinner, and the oil cells smaller and less turgid than that of the other treatments, while the colour of the rind was usually more deeply orange.

Fruit measurements taken during the 1936-37 and 1937-38 seasons showed no material differences in average fruit sizes of the three treatments. The rate of growth in the normally and heavily irrigated plots was fairly uniform throughout the growing season, but that of Treatment I showed a slowing down as the soil dried out, to be followed by a steep rise after an irrigation or rain.

(c) Influence on Tree Condition.

Trees under Treatment I usually wilted three or four times annually, and after the second year showed signs of defoliation, decline, and the general symptoms concomitant with harmful concentrations of brak salts. The foliage became smaller and sparse, while out-of-season fruit was more in evidence than in the case of the other treatments. Yields showed a tendency to diminish. The root system, however, appeared normal and healthy, with an abundance of fibrous roots in the first foot of soil.

The trees of Treatments II and III, on the other hand, never showed any signs of permanent wilting during the five-year period of the experiment; in fact, soil moisture studies suggest that for both treatments the amounts of water applied were actually in excess

op the optimum requirements. Below the third foot the moisture content was always close to the field capacity, and there was evidence of root decay. At the termination of this trial in 1941 the trees in Treatments II and III were in better condition than those in Treatment I although the heavily-irrigated ones exhibited chlorotic symptoms somewhat resembling " yellow branch ". No symptoms of nitrogen deficiency could be detected at any stage of the experiment. It is felt, however, that over-irrigation, quite apart from the harmful effects exerted on fruit quality, is bound to cause serious damage in time to citrus trees. It often results in the sudden death of the tree.

Summary and Conclusions.

The results obtained over a period of five years with an irrigation experiment conducted with Valencias at Willowtree emphasize the importance of soil moisture in the Valley. The following is a summary of the results :—

1. Under-irrigation, especially where the trees are allowed to wilt periodically, results in the accumulation of harmful brak salts in the soil (i.e. in the Sunday's River Valley) causing defoliation and general tree decline. Yields tend to decrease although the quality of fruit produced is excellent. " Puffiness " or " creasing " tends to increase under such conditions.

2. Over-irrigation, while resulting in better tree growth (temporarily, at least), higher yields and less " puffiness ", produces fruit of low soluble solids and inferior keeping quality. In many orchards where over-irrigation was practised, large quantities of fruit were rendered unfit for sale on account of low soluble solids. This position was rectified simply by reducing the amounts of water applied.

3. In order to obtain good yields and satisfactory quality, an intermediate course should be followed, i.e. 28 to 30 inches of water with moderate clean cultivation should be applied annually to citrus orchards in the Valley (this includes " effective " rainfall). In practice this amounts to the application of 2½ to 3 inches of water at each scheduled irrigation. Particular care must be taken that trees do not wilt during the period of blossoming and fruit-setting, i.e. from August to November. A slight amount of " drying-out " (but no excessive wilting) during the period of February to June appears to have favourable effects on fruit quality. Heavy irrigations during this period should therefore be avoided.

4. Since soil moisture is but one of the many factors involved in the successful production of citrus fruits, growers must also attend to other orchard-management practices such as weed and pest control and fertilization.

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Information on Beekeeping.

Division of Entomology, Pretoria.

BEEKEEPING is the most neglected agricultural industry in South Africa; and as a result it is estimated that honey to the value of £4,000,000 is lost to the Union every year.

This general neglect can be traced to the popular fear of the sting of the honey-bee and to the fact that the fundamental principles of bee-culture are not generally understood.

Bees, to be profitable, must be housed in modern movable comb hives and receive intelligent care. Although it is essential that certain things must be done at the right time, bees do not call for that constant daily attention that poultry-keeping demands.

The honey-bee's greatest service to mankind is as an agent in cross-pollination. Out of 220 different varieties of our principal orchard fruits which have been tested, 165 have been shown to be positively self-sterile. In these cases cross-pollination must be provided for if any fruit is to set. "*Busy bees bring bending branches*" is literally true, and on this account all progressive fruit-growers should interest themselves in beekeeping.

Marketing.—The importation of honey from overseas into the Union is prohibited, so that South African producers have the honey market to themselves. There is a profitable market overseas should the South African market become glutted.

Some Advantages of the Modern Hive.—The modern hive has the following advantages over the old primitive box hives which are unfortunately so common in South Africa:—

(1) The honey produced in the frames of the modern hive can be extracted from the combs by means of a machine called a "honey-extractor". The empty combs can then be returned to the bees to be refilled. Combs have been kept in use in this manner for over 40 years. Not only is a more wholesome product secured by this system, but a large amount of honey is conserved, as bees have to consume from 5 to 20 lb. of honey to produce one pound of wax or comb.

(2) With the modern hive, swarming, or the natural division of the colony, can be controlled. A division of the working force at a critical time results in little or no surplus honey for the beekeeper.

(3) In a modern hive the colony can be requeened systematically. The queen-bee is the mother of all the other bees in the hive; therefore the ability of a colony to gather a honey crop depends largely upon her fecundity. A good queen lays over 2,000 eggs a day at the height of the egg-laying period; old queens are not so prolific.

(4) In modern hives weak colonies can easily be united, and many other manipulations performed, which will ensure that there will be a maximum number of bees ready to gather the crop, when the main honey-flow of the locality commences.

(5) In the modern hive, disease of the brood can be detected and controlled, which is utterly impracticable when bees are housed in boxes or other primitive hives.

Type of Hive to Adopt.—The 10-frame Langstroth hive is the standard hive in America, Australia and New Zealand. It will probably become the standard hive for South Africa, where already it outnumbers all other types of movable comb hives. This hive should be fitted with telescope cover with metal top, wooden inner cover, and with full sheets of comb foundation wired in the frames. There should be two 10-frame brood chambers and a supply of supers

adequate to care for the maximum honey-flow. Deep or shallow supers are preferable according to circumstances. Beginners who do not wish to go to the expense of a honey extractor should get shallow extracting supers.

Necessary Equipment.—A good beginning in modern beekeeping can be made with the following equipment:—

A modern hive consisting of a bottom board, two 10-frame Langstroth brood chambers, three shallow extracting supers, one inner cover and one outer cover with metal top. All the frames should be fitted with full sheets of comb foundation with the wire properly embedded in the foundation.

One large bee smoker, the larger the better. One bee veil, one hive tool, and a good handbook on beekeeping.

Bees can usually be obtained from distinterested boxhive beekeepers in the neighbourhood, or so-called "wild swarms" can be hived from the veld. There are no beekeepers in South Africa who make a business of selling bees.

Beehives and parts, comb-foundation, bee-veils, smokers, beekeeper's gloves and embedders are now admitted free of customs duty. An introduction permit from the Division of Entomology is required for comb-foundation. The importation of bees and second-hand equipment is prohibited.

Transferring Bees to Modern Hives.

1. Smoke the bees a little, then remove the box-hive out of the line of flight of the bees, and substitute the new hive containing frames with full sheets of comb-foundation. As the field bees return, they go at once to the new hive.

2. Turn the box upside down, remove the bottom, and invert an empty box over the opening. Pound the box-hive vigorously for several minutes until the bees desert their combs and enter the box above. The bees cluster in this box like a natural swarm, and may now be shaken into or in front of the new hive as in hiving a swarm clustered on a tree.

In shaking the bees in front of the hive, place a wide board sloping from the ground up to the entrance and toss some of the bees in the entrance as well as on the board. A piece of newspaper or a cloth may be spread over this board to increase the surface up which the bees must crawl to the entrance. Spreading the clusters in this way facilitates the finding of the queen and her entrance can be noted.

3. The best combs of brood in the box may now be tied into frames and placed in the new hive; the remaining combs can be disposed of as desired.

Bees will rarely abscond if unsealed brood is present in the hive. As a precaution, should no brood be available, the queen-excluder zinc may be placed between the bottom board and the brood chamber, or a piece of this zinc may be nailed over the entrance, thus confining the queen to the hive. This excluder must be removed after the colony has established itself on the frames containing the comb-foundation. Feed the transferred colony liberally with sugar syrup; this will prevent it from absconding.

The honey from the box hive may be mixed with an equal volume of water, strained through a cheese-cloth, and fed to the bees as described in books on beekeeping. If there is a dearth of nectar and no feed is given, the bees will gnaw holes in the comb-foundation, which they may subsequently fill up with undesirable drone comb.

Pests and Diseases.

Ants.—In some localities ants trouble the bees to such an extent that they cause swarms, especially newly hived ones, to abscond. Wagon grease, motor oil, or corrosive sublimate can be used to isolate the hives against ants.

Disease.—European foul brood is the only serious brood disease that the South African beekeeper has to contend with, and it is very easily controlled. Preventive measures are: (1) ample protection, (2) requeening frequently, (3) leaving plenty of stores for the winter or any period of dearth. In brief, the treatment is to bring about conditions which keep the colony strong at all times.

American foul brood and Isle of Wight disease, two serious diseases in other countries, have never been found in South Africa.

Cardinal Points.

1. The successful beekeeper is he who studies his bees and is prompt with his manipulations. To be profitable, bees must receive intelligent care.
2. Bees need plenty of stores, plenty of room for brood, rearing, and adequate protection from wind and cold.
3. Practise swarm-control measures. Swarming during the honey-flow reduces the crop.
4. During the honey-flow give plenty of storage room, adding supers in advance of requirements. Neglect of this may result in the loss of more than half the crop.
5. It does not pay to cultivate any plant for bees. It may be possible in certain localities to improve the nectar resources by planting nectar-producing plants on waste land.
6. Do not let bees starve or even get so short of stores that they decrease brood-rearing before the honey-flow. A large force of bees at the right time must be the aim of every beekeeper. If it becomes necessary to feed, give a syrup consisting of two parts by volume of granulated sugar to one part of water. In warm weather one part of sugar to one part of water is preferable. Each established colony should have 40 to 50 lb. of honey for its own requirements.

Beekeepers' Associations.—The South African Association of Beekeepers, 16 Mons Road, Johannesburg.

The Natal and Zululand Beekeepers' Association, P.O. Swartkopskloof, Natal.

Instruction in Apiculture.—Short courses of instruction in apiculture are given at the Agricultural Colleges and at the Departmental Apiary, Pretoria. Further particulars are obtainable from this office.

Some Hints on Poultry Farming.

Preventing draughts in fowl-houses.—One of the chief causes of colds and roup in poultry is a draughty fowl-house. The roof should fit closely on the side walls. An opening of 3 to 4 inches must be left between the whole length of the back wall and the roof. To prevent side draughts in a long house, there should be a solid division every 25 feet from back to front, fitting the roof closely. Of great importance is the provision of ventilation below the perches, at intervals of 5 to 6 feet, an air-brick or similar substitute should be placed in the back wall, 6 inches from the floor. Outside a baffle plate (a piece of wood or flat iron) is placed over the air-brick, leaning against the wall, 6 inches above the top of the air-brick, projecting 6 inches on either side and resting on the ground 6 inches from the wall.

[E. F. Lombard, Professional Officer (Poultry), East London.]

A Method of Curing Good Veld Hay in High-rainfall Areas.

J. D. Scott, Officer in Charge of the Estcourt and Tabamhlope Research Stations.

IN *Farming in South Africa* of August 1938, a method of baling young green veld grass and the curing of the hay in the bales was described and advocated for the making of good veld hay. Attention was drawn to the fact that, when grass is young, the protein value is high and that, as the grass matures, so the feed value drops, particularly in the so-called " sourveld " areas with a high rainfall.

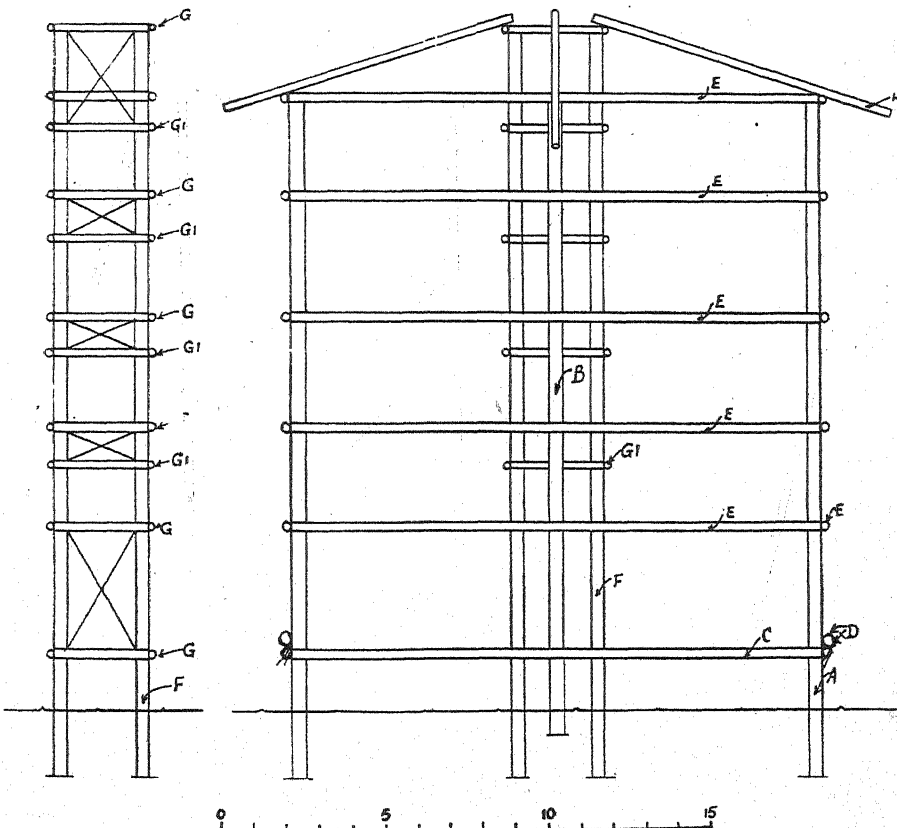


FIG. 1.—Chimney. FIG. 2.—Front Elevation.

Due to the high rainfall and its fairly good distribution during the summer, the making of hay has usually been left till the autumn when the grass is unpalatable, low in feed value and not of much use, except for bedding. When attempts have been made to cut it earlier or there have been late rains, the cocks have usually got wet, have been left on the veld for long periods and, in addition to having hay of the poorest quality, bare patches or patches of " Mlhegi " are left on the veld.

The baling method showed that high quality hay could be made right through the growing season despite the high rainfall, provided

that the bales were not tightly baled and were packed, under some sort of cover, with airspaces between them till cured. The main difficulty with the bailing was that the rate of haymaking depended on the speed of baling and, as this was relatively very slow, it meant that the making of hay was one long continuous job throughout the summer. This made it a handicap to all other activities on the farm.

Eventually Mr. G. F. Behr, farm foreman at Tabamhlope, suggested that if hay could be cut and stacked with airspaces through it on a similar principle to the bales stacked for curing, it would be possible to cure the hay without baling. Mr. J. A. Pentz suggested

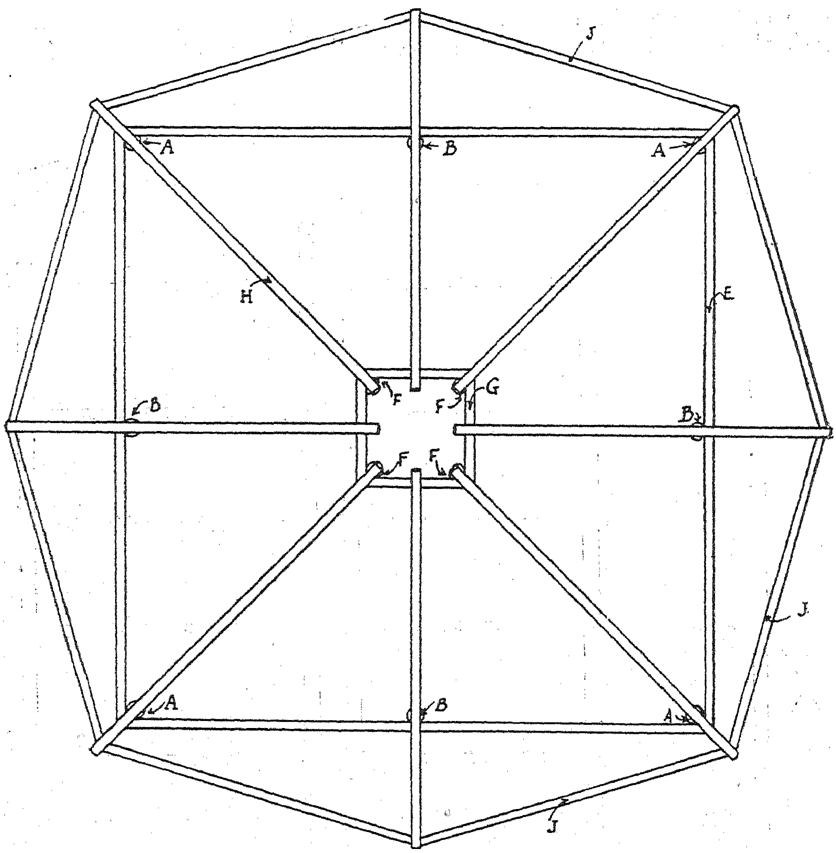


FIG. 3.—Plan of Roof.

that as a stack heated up most in the dead centre if not quite cured, a chimney in the middle of the stack would create a draught which would help to cure the hay. These two officers worked on a combination of the two ideas and evolved the " flue barn " for curing hay. This has been used and improved upon by Mr. Behr and other workers. Snags have been met and dealt with, and to-day all the veld hay on the Tabamhlope Research Station is made by means of these " Flue Barns ". It has been found that, by this means, all the veld hay—young grass—cut by two ox-drawn mowers in one day can be handled as fast as it is cut. It is possible to handle in one day what took two and half days with a baler, using less labour.

Flue-curing Barns.

The " flue barn " consists first of all of a central chimney. This is made by planting four poles 21 feet long (F) to a depth of two feet

to form a square with a minimum of two feet between each pole [Fig. 1 (G)]. These poles are 3 to 4 inches in diameter. Eighteen inches to two feet above the ground four struts [Fig. 1 (G)] of 1 to 1½ inches diameter are wired or bolted on. Every three feet above them, another set of struts (G) is wired on. Between each set of struts there is another set, approximately two feet above it, except between the two sets at the bottom (G. 1). The gaps between the two bottom sets of (G) and between (G. 1) and (G) above them, are covered with netting wire or old baling wire to prevent blockage of the chimney with hay. The gaps between (G) and (G. 1) are to take the flues.

Four poles nineteen feet long (A) are then planted to a depth of two feet, to form a square with the chimney exactly in the middle and at a distance of 16 feet apart. These poles are 5 to 6 inches in diameter. Halfway between each pair, another pole (B) of 3 to 4 inches in diameter is planted to a depth of 12 inches.

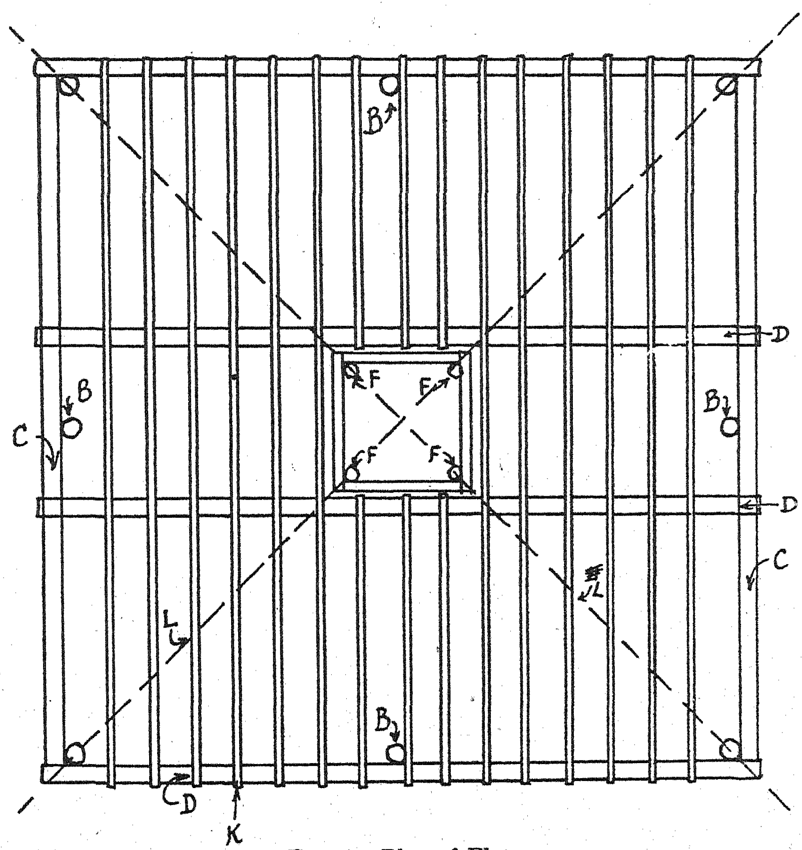


FIG. 4.—Plan of Floor.

Eighteen inches from the ground, two floor carrier beams 5 to 6 inches in diameter (Figs. 2 and 4 c) are bolted or wired to the upright corner and intermediate posts A and B. These help to support four floor beams (Figs. 2 and 4 D) which are of 2 to 3 inches diameter and which are also wired or bolted to the upright poles. These beams carry a light floor of wattle thinnings spaced just far enough apart to prevent hay from falling through on to the ground.

Three feet above the floor and every three feet to the top of the uprights, thin poles, 2 to 3 inches in diameter, are bolted or wired to the uprights on the outside as in Fig. 2 E. These support the flues running from the outside of the barn to the chimney as shown in Figs. 6 and 7.

From the chimney to the top of the outside framework of the flue-barn, roof supports (Figs. 2 and 3 H) of 1½ to 2½ inches in diameter are bolted or wired on as shown in the diagram. These carry either a layer of wire netting or very thin wattle thinnings on which is overlaid a thin layer of thatch grass. The roof is not heavily thatched but the pitch is sufficient to throw off any water and, as the roof-supports overhang by about two feet, the contents of the barn are well protected. The top of the chimney is left open.

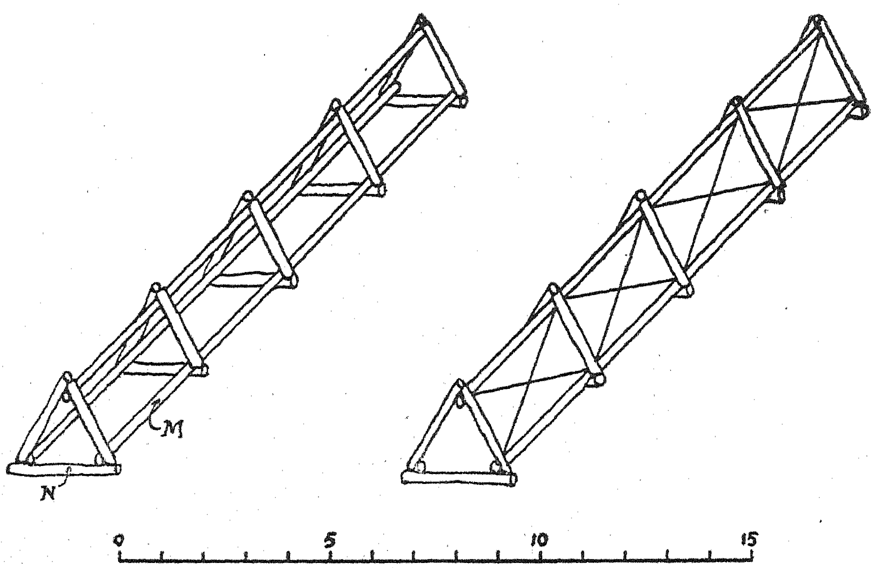


FIG. 5.—Flues.

Beneath the floor it is often advisable to increase the draught up the chimney by nailing two long sheets of thin galvanized iron, 18 inches wide, diagonally to the corner poles (Fig. 4 L). By means of this the slightest breeze under the floor is forced up the chimney.

Forty flues are then made. They consists of three poles of 1 to 1½ inches in diameter, 11 feet long, bolted together with cross pieces 18 inches to two feet long and of the same diameter as the long poles, to form a triangular flue with a minimum inside measurement of 12 inches between the poles. (See Fig. 5.) The spaces between the cross pieces are covered with netting wire or old baling wire to prevent the flues from being blocked by hay.

Method.

Haymaking is started as early in the summer as possible to get hay with a really high food value. It is cut as soon as the grass is long enough to give a cutting of 6 to 8 inches in length and it is found that, for this purpose, the best type of cutter bar for the mower is what is known as the " low cutter bar " or " golf course cutter bar ". This cutter bar, supplied for most makes of mowers, has double the number of " fingers " as compared with the " standard

cutter bar". It jams less frequently in tufts, is light in draught, and cuts the grass appreciably shorter.

As soon as the hay is cut, it is raked into windrows and immediately brought up to the hay barn by means of a sweep. It is thrown lightly into the hay barn—not packed tight—till it is built to the level of the first flue supports (E). The layer of flues is put in, two on one side and three on the other as shown in Figs. 6 and 7. Here hay is added till the next support is reached and another layer of flues is placed in position alternating with those below, and so on

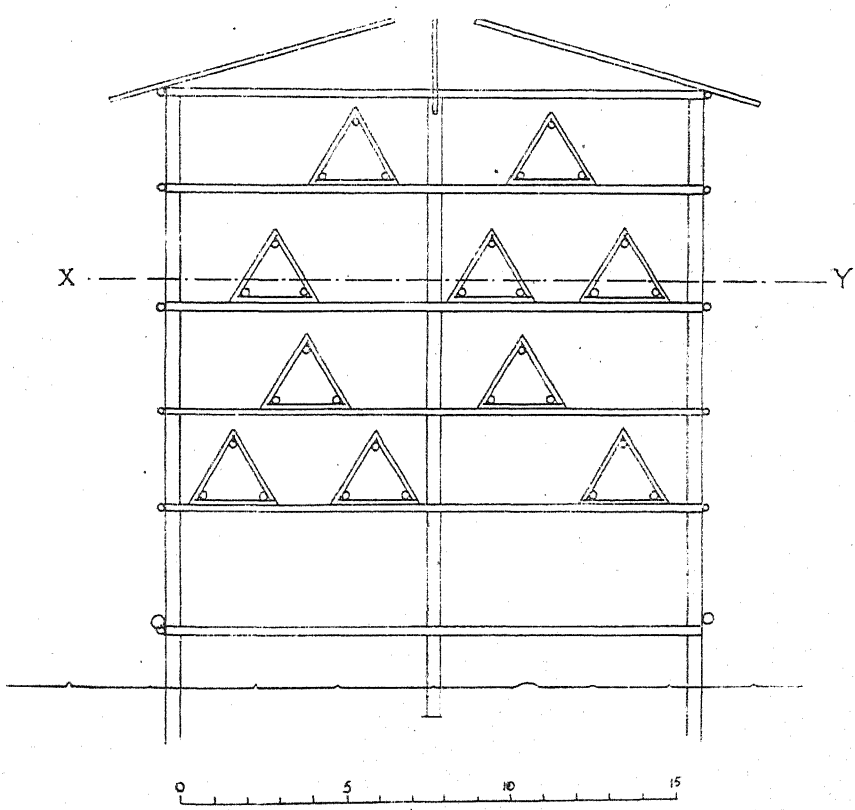


FIG. 6.—Position of Flues.

till the barn is filled. As the stack rises, the boys distributing the hay in the stacks stand on the flues so as not to compress the hay too much.

In normal summer weather with storms in the afternoons or at night, it is found that the hay will cure in four or five days when it can be taken out and stacked in permanent stacks and the flue curing barn used again and again. In consistently moist or misty weather it may take up to ten days. As the green grass in the barn begins to heat, it sets up a draught in the chimney which draws air through the flues, so removing moisture in the grass and curing the hay. The iron strip (L) forces every breeze, whichever direction it comes from, up the chimney and so increases the draught.

It is often impossible to fill the barn in one day due to operations being interrupted by rain. It is found that if the barn is partly filled one day, fresh grass cannot be stacked in it the following day

as it compresses the previous day's cut too much and causes rot. To obviate this, it has been found advisable to fill the barn in quarter sections at a time, right up to the roof. In actual practice this makes the filling of the barn an easier operation and, should only half the barn be filled one day, it is possible to fill the other half the next day without any danger of loss.

Points to be borne in mind are that this method has been evolved for short veld grass which is not very weighty. Long grass does not cure so easily and may require extra supports. The grass should be

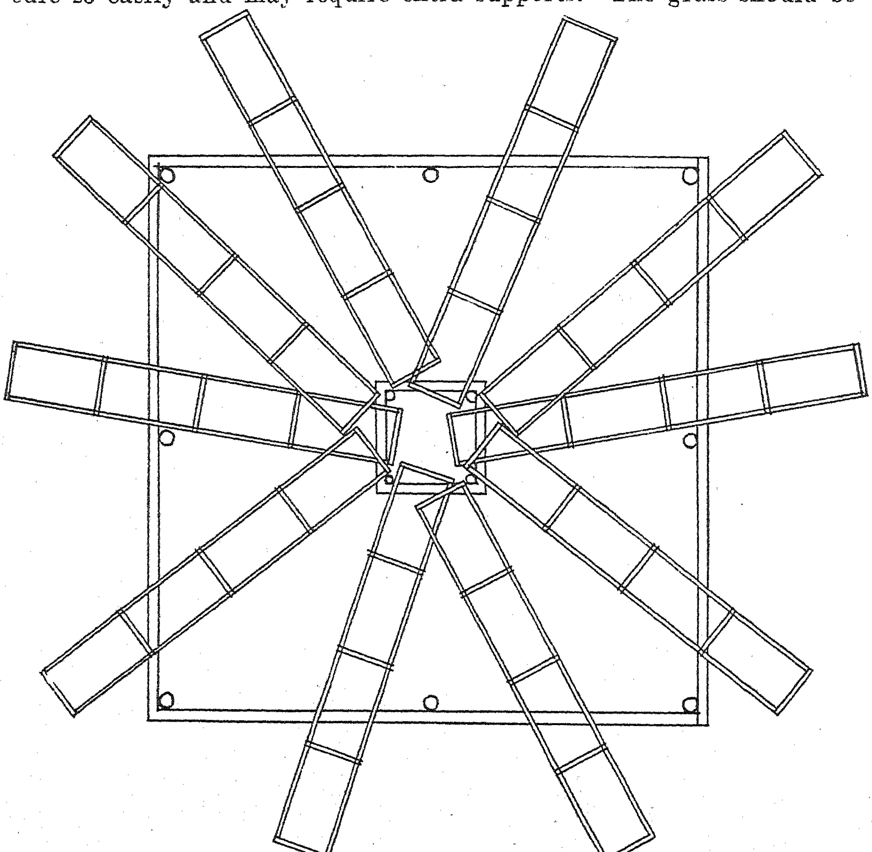


FIG. 7.—Section through FIG. 6 at XY.

thrown in loosely and not trampled down, the boys filling the barn standing on the flues as the level of the hay rises.

The cost of hay produced in this manner has worked out at between 7s. 6d. and 10s. per ton, with labour at an average of 1s. 2d. per day and taking all costs into account (including depreciation in machinery, spares, transport, etc.), except interest on the price of land. The average protein value of hay from samples taken weekly in kraals during the winter over the past two years at Tabamhlope has been 6·98 per cent. Oxen fed only on the hay in the winter have gained an average of 2½ to 4 lb. per week over the whole winter.

Conclusion.

There is no doubt that this method of curing young veld hay has great possibilities in the high-rainfall areas. It is now being used

with success by a number of farmers as well. It is not claimed that it is a suitable method for heavy crops like cowpeas or soyabeans which are much better cured on racks of the type described in *Farming in South Africa* of August 1941, but for young grass with a high feed value in high-rainfall areas it is entirely satisfactory.

Materials required.

The following materials are required for the construction of the "flue barn" and "flues".

(Letters refer to the diagram.)

A.	Corner uprights..............	5–6 inches diameter.......	19 feet long.....	4
B.	Intermediate uprights........	3–4 inches diameter.......	18 feet long....	4
C.	Floor carrier beams..........	5–6 inches diameter.......	16 feet long....	2
D.	Floor beams.................	3–4 inches diameter.......	16 feet long....	0
E.	Flue supports...............	2–3 inches diameter.......	16 feet long....	24
F.	Chimney corner poles........	3–4 inches diameter.......	21 feet long....	4
G.	Chimney cross poles.........	1–1½ inches diameter.......	2½ feet long....	24
G.1.	Chimney cross poles.........	1–1½ inches diameter.......	2½ feet long....	16
H.	Roof supports...............	1–2 inches diameter.......	10½ feet long....	8
J.	Roof poles..................	1–2 inches diameter.......	10 feet long....	8
K.	Floor.......................	1–2 inches diameter.......	16 feet long....	40
L.	Flat iron under floor, any gauge	18 inches wide............	24 feet long....	2
M.	Flue lengths................	1–1½ inches diameter.......	11 feet long....	120
N.	Flue cross pieces...........	1–1½ inches diameter.......	1½–2 feet long..	600

Other requirements are bolts or No. 10 wire netting or old baling wire for the roof, flues and spaces between G. 1 and G. on the chimney, and thatch grass.

A Bulletin on Poultry Farming.

THERE has been such a great increase in the demand for literature on poultry farming during the past few years that almost all bulletins on the various aspects of this subject have been sold out. Dr. J. J. Bronkhorst, Senior Poultry Officer, Division of Animal and Crop Production, has therefore written a detailed bulletin on poultry farming which has just been published as Bulletin No. 241. In this bulletin the author has endeavoured to review the various branches of poultry farming. Owing to the shortage of paper the bulletin is naturally very compact and no information on the housing of laying hens and the preparation of table birds is given, as these subjects are dealt with in bulletins Nos. 126 and 190 respectively.

Subjects discussed are: poultry farming in South Africa; artificial incubation of eggs; rearing of chicks; the significance of the rôle played by feeding; judging fowls for egg-production; the mating and breeding of fowls; the marketing of eggs; the most important poultry diseases; the economic aspect of poultry breeding, and factors to be considered in laying out a poultry farm.

The bulletin contains 69 illustrations, covers 100 pages and is obtainable from the Editor of Publications, Department of Agriculture and Forestry, Pretoria, at 1s. per copy.

Care of Lucerne Lands in Winter.

W. v. d. Merwe, Field Husbandry Research Officer, Vaal-Hartz Experiment Station.

AS a result of the prevailing high prices for lucerne hay there is a tendency among farmers to try and obtain the maximum yields from lucerne lands without taking into consideration the ultimate effect this practice is likely to have on the stand and life of the crop. As soon as the stage is reached where the stand has become too thin or grass and weeds have encroached to such an extent that the yield and quality of the hay is reduced, the lucerne land is simply ploughed up and other soil sown to this crop. The costs involved are not given any serious consideration, since prices are high at present, and as there is a considerable difference between production costs and the selling price, the cultivation of this crop is extremely remunerative. Once the stand in a land which formerly yielded economic crops, has become very thin, it will be found that it is no longer worth the trouble and cost to fertilize, irrigate and cultivate such a land. The land will have to be prepared all over again and lucerne established anew—a very expensive process, especially when prices are low. In addition, this would also further increase the production costs.

The importance of obtaining a good stand and of prolonging the life of established lucerne lands cannot be too strongly emphasized. It is impossible to deal with all the factors involved in this connection, but what is of the utmost importance is the treatment which lucerne receives during the winter, or during the period of rest. Usually not only as many cuttings as possible are made, but any further growth after the last cutting is also grazed off by stock. If in the opinion of the owner the lucerne land does not provide sufficient pasturage during this natural period of rest, all sorts of methods are resorted to in an effort to force the crop to grow, or otherwise no trouble or cost is spared in ploughing up the old, proven variety and establishing another which it is claimed will grow throughout the winter. It is wiser not to expect any miracles from a lucerne land during the winter. The treatment and care of a land during the winter months must be of the best in order to ensure that the yield will not be reduced during the following season.

The amount and rate of new growth in lucerne is largely determined by the quantity of reserve nutrients present in the roots of the plants upon the advent of spring. In order to prevent grasses and weeds, which generally grow with surprising rapidity immediately after the winter, from smothering the lucerne, every effort must be made to ensure that the lucerne emerges strong and vigorous from its winter rest, so that it can overcome any competition. The treatment of the land during this period must, therefore, be of such a nature that the maximum amount of reserve food can be built up in the roots of the plants. The carbohydrate constituents (starches, sugars, etc.) of the roots are particularly important since these substances are readily used up by the plant and must, therefore, be regarded as the most essential reserve nutrient when new growth begins in the spring. It has been established that after every cutting the carbohydrate content of lucerne roots reaches a minimum after about 20 days, the original level being attained after another 10 to 15 days.

This means that only after 4 to 5 weeks is the temporary deficiency of carbohydrates in the roots completely made up again.

It stands to reason, therefore, that if lucerne is repeatedly cut at too young a stage, the development of the root system will be detrimentally affected. A point of still greater importance, however, is how and when the last cutting of the season is made. The number and development of the buds in the crown are determined by the amount of growth remaining at the beginning of winter; in other words, the larger the reserve of plant foods built up in the roots immediately before the advent of winter, the greater is the chance that the plants will survive the winter without being damaged by frost, and be able to make rapid and early growth in the spring.

It is of paramount importance, therefore, that the last cutting should be made in good time, so that a further growth of at least 6 inches can take place before the first frost falls and the rest period commences. It should be clear from the foregoing why the practice of allowing the poor winter growth on lucerne lands to be grazed off, must be condemned and abandoned altogether. It has even been found that lucerne lands should not be grazed too early or too heavily in spring, but rather when the lucerne has reached the flowering stage. Similarly, grazing during the summer months is also less detrimental than in autumn.

The wisest course, therefore, is to allow lucerne lands to enjoy a real rest during winter with sufficient food stored up in the roots and a reasonable amount of foliage for protection against the cold. Irrigation during this period is also quite unnecessary since it tends to have an adverse effect on the plants by forcing untimely growth and so accelerating the rapid exhaustion of the food reserves.

Where fertilizer is applied this should be done before the plants start developing new buds in the crown upon the advent of warmer weather. The foliage which has been partly killed by the frost, can now be cut or rapidly grazed off if it hampers the application of fertilizer and subsequent cultivation. Take care, however, not to graze the lucerne too heavily. After the fertilizer has been applied, it must immediately be worked into the surface layer of soil by means of a spring-tined harrow in the case of lighter soils, or with a heavier implement like a Martin or Killifer cultivator if the soil is heavy. Although this cultivation might damage a lucerne plant here and there, the crop as a whole will greatly benefit. Grass and weeds are also effectively controlled in this way and the aeration of the top layer of soil will have a beneficial effect on the plants.

A thorough irrigation should follow at once in order to make the fertilizer available to the plants immediately. This will ensure early and vigorous growth and good yields throughout the new season.

SHORTAGE OF TETROL.

THE Director of Veterinary Services, Onderstepoort, announces that owing to the shortage of one of the ingredients of tetrol it is at present no longer possible to prepare supplies of this remedy. In view of the prevailing war conditions, it is extremely difficult to say when supplies will be available again, but as soon as this Institution is able to resume the preparation of tetrol, the necessary notification will be given in regard to the matter.

Farmers are therefore requested not to place any further orders since any money forwarded, must merely be refunded.

Practical Home-made Self-feeders for Pigs.

A. B. Emmerich, Agricultural Engineer, Grootfontein College of Agriculture, Middelburg, C.P.

ON the strength of results gained in the course of numerous experiments during recent years, as well as on actual results in farming practice, the use of self-feeders for fattening pigs can be recommended. The chief advantages of a self-feeder may be summarized as follows:—

1. Its use effects a considerable saving in time and labour, a very important consideration at the present time.

2. Feed is consumed more rapidly with the result that larger daily gains in live weights are obtained and the pigs are brought to a marketable size in a shorter period of time.

3. There is an actual saving in the amount of feed required to produce 100 lb. gain in weight.

Construction.

Plan No. 1 shows the construction of a semi-portable type of feeder, in that only the upper portion, consisting of the hopper and roof, can be shifted from place to place, the trough portion into which the feed flows being cast in concrete in position, where it remains. The casting of two or more concrete bases of identical dimensions on different previously selected sites, allows of the hopper portion of the feeder being shifted and placed in position on any desired base. This will obviate the necessity of constructing an unnecessary number of feeders under certain circumstances.

The weight of the timbering, assisted by the action of the haunches left on posts (*h*), is sufficient to prevent overturning of the feeder.

The internal frames are first nailed or preferably bolted together. Their number depends upon the length of the feeder which is arbitrary, and they consist of members (1) to (7) composed of ties Nos. (1), (7) and (4), verticals (2) and (6), and braces (3) and (5). One completed frame can conveniently be used as a templet for the construction of the rest, and for determining and accurately fixing the spacing of the end posts (*h*), which are then boarded up with 1-in. matched flooring boards (*e*). The completed ends and internal frames may then be fixed by boarding up the sides in the same way as the ends. The roof and filling door (*j*) may then be completed and fixed. Upon completion of the above-described portable portion of the feeder, the concrete base, comprising the trough and non-portable portion of the feeder, may be cast.

This can best be done by first casting the concrete floor and sides (mix 1:2½:5) with the aid of the necessary shuttering. The surface to be covered by the inverted "V", portion (*a*) (1:3:6), which is cast when the sides have set, should be left with a rough surface and may have various "plum" stones (*b*) left protruding, which will promote the bond and materially decrease the quantities of aggregates required. Owing to the shape which renders it more or less awkward to obtain a sufficiently smooth surface, the sloping sides of (*a*) should be plastered with ¼-in. thick cement of 1:3 mixture. Care should be taken to insert wooden plugs of the correct size and

shape into the concrete base to provide the necessary holes to take the haunches of the posts (*h*). These plugs should be slightly tapered in a downward direction and well oiled to facilitate their extraction, which is done when the concrete is still green but sufficiently set to prevent slumping. Slots (*n*) should be left in the concrete to allow ties (4) to fit properly into place. The upper surface of the side and end walls (*o*) should be sloped outwards in order to shed water.

A swinging flap (*c*), suspended by means of a $\frac{1}{2}$-in. rod through the hinge at (*f*) and made of 18-gauge sheet iron provided with a $\frac{3}{8}$-in. by 1-in. iron strip (*d*) for rigidity, forms an automatic protective trough cover. The pigs can easily push this flap back while feeding, but as soon as they leave the feeder the flap returns to its original position by its own weight and excludes rain and wind.

List of Materials Required for Plan No. 1.

Size.	No. of Pieces.	Length.	Description.
4″ × 3″	2	4′ 6″	Posts (*h*).
4″ × 3″	2	4′ 0″	Posts (*h*).
3″ × 2″	2	3′ 6″	Posts (*g*).
4″ × 2″	2	3′ 11″	Ties (1).
4″ × 2″	2	3′ 10″	Ties (7).
4″ × 2″	2	2′ 8″	Ties (4).
4″ × 2″	2	3′ 0″	Verticals (6).
4″ × 2″	2	2′ 7″	Verticals (2).
4″ × 2″	4	2′ 1″	Braces (3) and (5).
2″ × 2″	3	6′ 0″	Purlins.
2″ × 2″	2	4′ 7″	Door posts (*m*).
1″ × 6″	16	6′ 0″	Side boarding (*e*).
1″ × 6″	15	4′ 0″	End boarding (*e*).
1″ × 6″	2	1′ 10″	Door ledges.
1″ × 6″	4	4′ 7″	Door battens.
1″ × $\frac{3}{8}$″	2	6′ 0″	Flat-iron flap reinforcing (*d*).
18 gauge	2	1′ 2″ × 6′ 0″	Sheet iron flap.
	2	4′ 8″	Corrugated iron roof sheets.
	1	1′ 6″ × 3′ 6″	Malthoid door cover (*j*).
2$\frac{1}{2}$″	2	—	Butt hinges (*k*).
$^7/_{16}$″ × 5″	4	—	Iron bolts, nuts and washers.
$\frac{3}{8}$″ × 3$\frac{1}{2}$″	8	—	Iron bolts, nuts and washers.
	1 lb.	1$\frac{3}{4}$″	Nails.
	4 lb.	2$\frac{1}{2}$″	Nails.
	1 lb.	5″	Nails.
188 lb.	1	—	Bag Portland Cement.

Capacity of feeder: 11 cubic feet per foot run.
Capacity of muid sack: 4 cubic feet.

Plan No. 2.

The above feature, together with the greater feed-holding capacity and non-perishable base, forms the chief advantages of plan No. 1 over plan No. 2.

The latter is a completely portable feeder constructed almost entirely of timber. To increase the strength of the feeder and its life, the importance of mortice and tenon joints in tying the frame pieces cannot be over-emphasized. It is built on skids (*e*) to facilitate its removal from place to place, and is provided with adjustable slides (*a*) by which the flow of feed into the trough from the hopper may be regulated. Each slide is provided with slots (*f*) and wing nuts (*g*) for adjusting purposes. Similar adjustable slides may be fitted to plan No. 1 if required.

The roof (*b*) consisting of matched flooring boards covered with malthoid has a considerable overhang to prevent rain from entering the trough, while the projecting end boarding (*d*) protects the feed from the wind. The action of these, however, is not complete and can be improved by providing hinged side flaps.

In order to prevent pigs standing broadside in the trough while feeding, flat-iron guards (*h*) are provided as shown.

In order to facilitate the reading of the drawing by the farmer, the material shown is mostly planed timber. This is not essential, however, and profitable use can be made of rough material obtainable from the various sawmills. By using the accompanying plans as a guide the farmer can, at inconsiderable expense, combine his available odd pieces of material into a labour-saving article that will reap him ample reward.

LIST OF MATERIALS REQUIRED FOR PLAN NO. 2.

Size.	No. of Pieces.	Length.	Description.
6″ × 3″	2	6′ 9″	Skids.
6″ × 1¼″	2	6′ 0″	Trough base.
4″ × 2″	3	4′ 0″	Posts.
4″ × 2″	3	3′ 9″	Posts.
4″ × 2″	2	6′ 0″	Upper horizontal length ties.
4″ × 2″	3	3′ 8″	Lower cross ties (trough ends).
4″ × 2″	1	2′ 0″	Upper cross tie.
3″ × 2″	2	6′ 0″	Trough sides.
2″ × 2″	6	1′ 7″	Inverted " V " supports.
1″ × 8″	2	6′ 0″	Adjustable slides.
1″ × 6″	4	4′ 0″	Matched end boarding.
1″ × 6″	2	3′ 6″	Matched end boarding.
1″ × 6″	2	3′ 0″	Matched end boarding.
1″ × 6″	2	2′ 6″	Matched end boarding.
1″ × 6″	6	2′ 2″	Matched end boarding.
1″ × 6″	14	6′ 0″	Matched side boarding.
1″ × 6″	7	6′ 0″	Matched flooring for inverted " V ".
1″ × 6″	13	4′ 3″	Matched boarding for roof.
1″ × 6″	4	2′ 0″	Roof cleats.
1″ × 6″	2	2′ 4″	Door ledges.
1″ × ¼″	14	1′ 10″	Flat iron-guards.
⅜″ × 2¾″	4	2¾″	Iron bolts with wing nuts.
½″ × 7″	12	7″	Iron bolts with nuts and washers.
	1 Gross	1″	Screws.
	1 lb.	1¾″	Nails.
	4 lb.	2½″	Nails.
	1 lb.	5″	Nails.
2′ 2″ × 4′ 6″	2	4′ 6″	Malthoid roof sheeting.
2′ 6″ × 4′ 6″	1	4′ 6″	Malthoid door cover.
6″	2	—	T hinges.

Capacity of feeder: ± 6⅓ cubic feet per foot run.

" Foods and Cookery ", Bulletin No. 115, is out of print.

Bulletin No. 237, " Eggs and Poultry in Cookery ", which contains many useful recipes, is obtainable at 6d. per copy from the Editor.

Poisonous and Non-poisonous Algae (Waterbloom, Scum) in Dams and Pans.

Dr. Douw G. Steyn, Onderstepoort.

NOW that it has been discovered that many dams and pans, particularly in the south-eastern Transvaal and the north-eastern Orange Free State are infested with a toxic alga (*Microcystis flos-aquae*) (see *Farming in South Africa*, July, 1943) it is imperative for the health of man and beast alike that this pest be eradicated. There are also many other and non-toxic algae which are troublesome in dams and which can be eradicated in a similar manner. As some dams are stocked with fish and vary in size, the methods of eradicating these algae are here discussed under different headings.

It might be mentioned in passing that algae require sunlight for their development, and consequently cannot grow in reservoirs with roots which exclude the light.

Applying Copper Sulphate.

There are three reasons why it is inadvisable to dissolve copper sulphate continuously in water, namely:—

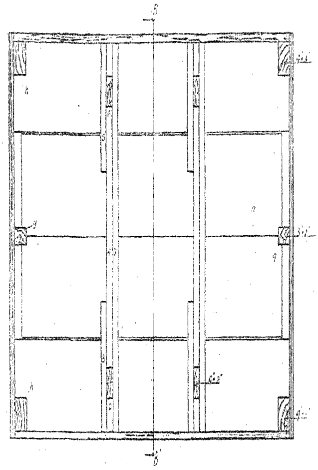
(1) If the harmful algae are in constant contact with copper sulphate they are prone to become resistant to it and, consequently, we may eventually be unable to eradicate them with blue vitriol.

(2) Although various kinds of fish vary in their susceptibility to blue vitriol, it is a poison for them and they should not be kept for long periods in water containing appreciable quantities of this poison. Dilutions of copper sulphate which do no harm to mature fish may affect immature ones.

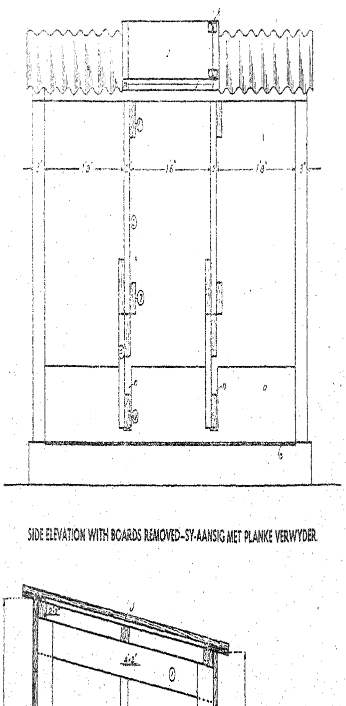
(3) A third reason why it is inadvisable always to have copper sulphate in the water is that there are various kinds of algae which serve as food for fish and others which play an important rôle in the purification of water. We naturally want to protect these useful kinds of algae. In the course of the last year we gained considerable experience in regard to the eradication of the poisonous alga without causing any harm whatsoever to the fish in the treated water. If the directions in this pamphlet are carefully carried out, fish will not be killed by the copper sulphate. It has been our experience that the poisonous alga disappears for at least a few months after a single treatment with blue vitriol; hence it will not be necessary to treat the same dam or pan more than once or twice annually. The greater the effort to eradicate the poisonous alga, the less trouble it will cause in future. *Please remember this!*

(*a*) *Small Fish Ponds*.—In this connection we have in mind small goldfish ponds. Goldfish are rather highly susceptible to copper sulphate (blue vitriol) poisoning and it is, therefore inadvisable to treat the water while the fish are still in it. The safest course is to remove the fish and to place them temporarily in a tub or other suitable container. After the fish have been removed, copper sulphate must be dissolved in the water at the rate of about 1 lb. for every 5,000 gallons in the pond, i.e., approximately 1 oz. or two tablespoonfuls for every 300 gallons of water. *The copper sulphate crystals should not be thrown in the water but must first be dissolved in one or two gallons of water and then poured or, better still, sprayed over the whole surface of the pond.* This copper sulphate water should be left in the pond for at least four to seven days (the

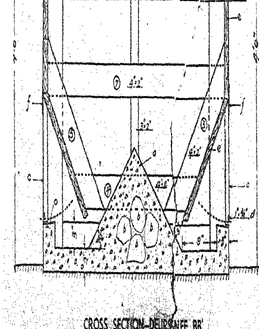
PLAN NO. 1.



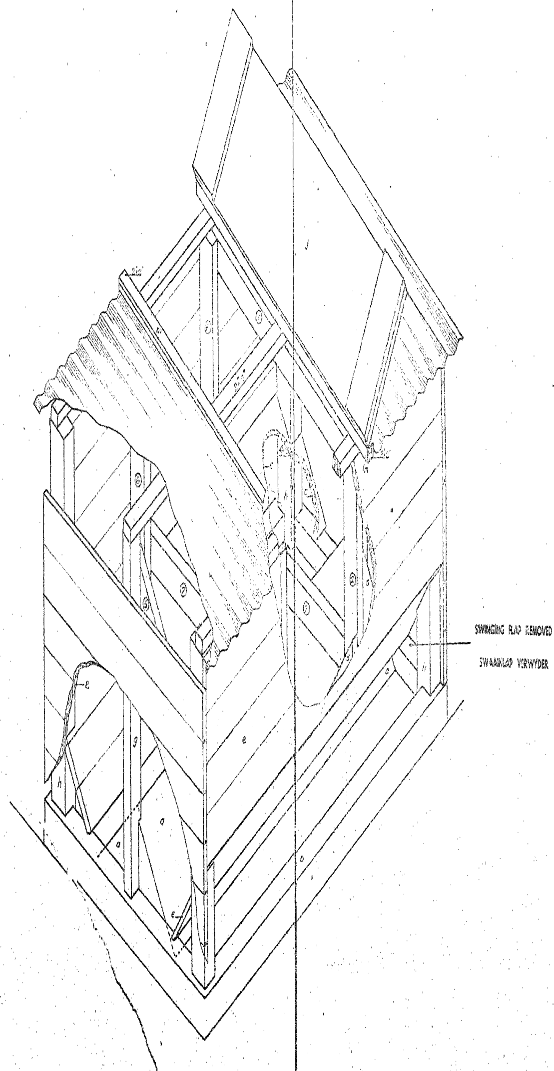
SECTION AA'-DEURSNEE AA



SIDE ELEVATION WITH BOARDS REMOVED-SY-AANSIG MET PLANKE VERWYDER.



CROSS SECTION-DEURSNEE BB'



ISOMETRIESE AANSIG-ISOMETRIC SKETCH.

SEE BACK FOR PLAN No. 2

SIEN AGTEROP VIR PLAN No. 2

longer the better). Scrub the sides and bottom of the pond thoroughly with a hard brush or broom while the water is still in the pond. After four to seven days allow the water to run out and flush the pond properly with clean water. Then fill the pond with clean water and put the fish back.

Cleaning of Dams.

(b) *Watering Dams for Stock: It is necessary here to warn farmers against the practice of keeping carp in dams used for watering animals. The fish pollute the water and consequently render it unhealthy for stock.*—We have frequently had troubles of this kind.

If small galvanized-iron dams or troughs are severely infested with algae, especially those species which attach themselves to the sides of such dams, the best course is to carry out the first cleaning in the same manner as prescribed for fish ponds under (*a*).

Subsequently such dams can be kept clean by using 1 lb. copper sulphate for every 100,000 gallons of water. The *calculated quantity of copper sulphate, depending on the size of the dam, should first be dissolved in a few bucketfuls of water, and then poured or sprayed over the whole surface of the dam.* The addition of copper sulphate to the water should be repeated once or twice until the algae have disappeared, after which the treatment should be discontinued until signs of re-infestations appear. *It is inadvisable, however, to keep on dissolving copper sulphate in dams, since the algae are inclined to grow accustomed to it with the result that eventually they are no longer controlled by it.*

In the case of dams containing various kinds or fish (yellow fish, carp, etc.), only 1 lb. of copper sulphate should be dissolved in every three hundred thousand gallons of water in order to kill the poisonous alga. Unfortunately there are harmful species of algae which will not be destroyed by such a low concentration of copper sulphate in the water. On the other hand, it is very fortunate that the toxic species can be eradicated by such a small quantity of copper sulphate.

Unfortunately, no reliable information is available in connection with the toxicity of copper sulphate in water for all the different kinds of fish. Consequently, those persons who treat their fish ponds with copper sulphate, should immediately discontinue the treatment if some of the fish, particularly small ones, begin to die. It might be mentioned here that in all cases where large dams were treated with copper sulphate on an extensive scale, no harmful effect on the fish was observed. At times, 1 lb. of copper sulphate was dissolved in every one hundred thousand gallons of water.

(*c*) *Large Dams and Pans.*—If the infested dams and pans are very large, it is usually necessary to have the quantity of copper sulphate calculated by an expert, since it is very difficult and dangerous to make one's own estimate. In calculating the quantity of water, it is useful to remember that 1 cubic foot of water is equivalent to $6\frac{1}{4}$ gallons.

Dams of the size of the Vaaldam and Hartebeestpoort Dam for example, should be divided into sections and the required quantity of copper sulphate calculated for each section. The calculated quantity of copper sulphate is then placed in bags, and dragged through the water with the aid of a motor boat. Since this method cannot be applied by private individuals, it will not be discussed in detail. In the case of smaller dams containing, say, only a few million gallons of water, the copper sulphate can be dissolved by placing it in bags which are hung over the sides of a motor boat

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The Control of Cabbage Pests.

F. J. Stofberg, Entomologist, Sub-tropical Horticultural Research Station, Nelspruit.

Bagrada Bug.

THIS pest is a sucking plant bug, which robs the plants of their sap to such an extent that dwarfing and wilting results. Damage can be so severe that young plants are killed outright, with the result that occasionally it is not possible to raise a single decent plant from several pounds of seed sown.

The Bagrada bug is essentially a pest of cabbage seedbeds, but may also cause considerable damage on the lands after transplanting. However, if strong healthy plants can be raised, half the battle is won since the Bagrada bug seldom causes any appreciable damage to vigorous plants after transplanting.

The chief aim, therefore, should be to raise healthy seedlings, which can only be obtained by promptly controlling this pest when it appears. For spraying, the best mixtures so far discovered are made according to the following formulae:—

(*a*) Crude carbolic acid—1 pint.
soap (good yellow)—1 lb.
water—1 gallon.

Shave the soap into boiling water and dissolve, then stir in the carbolic acid and boil for 30 minutes. For use, this stock emulsion is first diluted by using 1 part by volume in 15 parts of water. The adult bugs are much more resistant to these sprays than the young nymphs.

(*b*) 60 per cent. commercial methylated spirit—1 pint.
soft or yellow soap—1 lb.
water—2½ gallons.

Dissolve the soap in the water overnight, and stir in the methylated spirits just before use. This spray mixture must be used immediately, and in contrast to mixture (*a*) cannot be kept over. It must be borne in mind that both the above sprays are contact poisons, that is, they will kill only those bugs which are actually touched by the spray. Spraying operations must consequently be very thorough. Stomach poisons such as lead arsenate are of no avail against these bugs since they suck the sap from the plant tissues and therefore cannot ingest a poison adhering to the surface of plants.

A very practical method of growing healthy cabbage plants is to have the seedbeds under frames, which prevent the bugs from getting on to the young plants. Such frames are easily constructed from 6-inch flooring boards, which are then covered with cheese cloth, or, if more durable material is preferred, mosquito wire gauze may be used. The frames are placed over the beds in such a way that the bugs will not be able to crawl through underneath. Another method which in practice was found to give excellent results was simply to fence in all the beds with mosquito wire gauze 3 ft. in height. The bagrada bugs did not seem able to crawl over or fly higher than this 3-ft. fence. Bugs which collected on the outside of the gauze fence were occasionally burnt with a blow-lamp.

Caterpillars.

These are the larvae of two or more species of moth, e.g. the diamond-back moth (*Plutella maculipennis*), commonly known as

"spin worm", and the larger cabbage moth (*Crocidolomia binotalis*), which feeds on and skeletonizes cabbage leaves. Infestation can be so severe that a whole cabbage crop may be rendered useless for marketing purposes.

On the highveld these two species of moths do not cause such severe infestations, and in practice it has been found that dipping the seedlings (before transplanting) in a mixture of 3 ounces of lead arsenate plus half an ounce of calcium caseinate spreader in 4 gallons of water is effective enough to protect the plants against these caterpillars for several weeks until natural parasites have multiplied sufficiently to keep the caterpillars in check.

In the lowveld, however, growers usually experience severe infestations of the diamond-back moth which is seldom controlled by natural parasites, so that one is forced to rely on chemical control if the crop is to be saved. Any one of the following dusting mixtures of three stomach poisons gives good control of both species of cabbage caterpillars.

1. Lead arsenate—1 part (by weight).
   talc—3 to 4 parts (by weight).
2. Calcium arsenate—1 part (by weight).
   talc—3 to 4 parts (by weight).
3. Cryolite—1 part (by weight).
   talc—1 part (by weight).

Mix the poison and talc very thoroughly. The talc in the above dusting mixtures is included merely to make the poison more flowable and to facilitate its application. Dusting can be carried out by means of a dusting machine or by means of a small bag made of porous material such as muslin. These dusts should be applied early on a calm morning when dew is still present on the plants. as this will cause better adherence of the dust.

Usually two or three dustings at the rate of about 30 lb. of dust mixture per dusting per half morgen of plants is sufficient to control the caterpillars, and, furthermore, does not constitute any danger to the consumer. This statement is based on actual analyses of cabbages which were dusted with various quantities of the above three poisonous dusts. The grower should be warned, however, against the practice of late dustings, i.e. cabbages should not be dusted later than 5 weeks before harvesting.

Certain dusts containing pyrethrum and derris extracts have also been found to give excellent control of cabbage caterpillars. Unfortunately, these materials are unobtainable at the present time, and are rather expensive even under normal conditions. They have the advantage of being non-poisonous to man. The above-mentioned species of caterpillars may sometimes attack seedbeds, in which case a dusting with one of the above poisonous dusts will also give control.

Cabbage Aphids.

These small sucking plant lice may attack cabbages in seedbeds as well as on the land. Control is obtained by either dusting or spraying with nicotine.

Nicotine dusts of 2 per cent. and 4 per cent. strength are normally obtainable on the market. If spraying is decided upon, the nicotine is usually made up as follows:—

Nicotine sulphate (40 per cent.), 1 part in 800 parts of water.
Nicotine extract (7 per cent.), 1 part in 100 parts of water.

 [Continued on page 472.

Problems of Bacon Production in the Western Cape Province.

G. W. Johnston, Stellenbosch-Elsenburg College of Agriculture.

THE problems of bacon production in the Western Cape Province can best be considered under the headings of (1) breed, (2) feeding and (3) marketing.

(1) Two breeds are mainly used for the production of bacon pigs in the Western Cape Province, viz., Large Whites and Large Blacks.

Large Whites.—The Large White is the breed which was used to improve bacon pigs in all the leading bacon-producing countries of north-western Europe. These countries are producing a similar type of bacon to that required by the South African market and also by the English market, to which any surplus bacon would have to be sent. Undoubtedly it would be easiest to breed a bacon pig by careful selection within the Large-White breed, and the only question is: "Are white pigs sufficiently resistant to sunscald under all reasonable conditions in South Africa?"

The question of sunscald is largely bound up with the grazing, and the grazing with economy of production. The most suitable grazing crop is lucerne, but unfortunately lucerne is particularly liable to cause sunscald. Most English books on pigs say that white pigs are liable to suffer from sunscald especially when grazing on clover. Clover (*trifolium*) is almost unknown in the Western Cape Province, but lucerne and bur clover (Medicagos) seem to be equally liable to cause sunscald. At Elsenburg pigs are certainly more liable to sunscald when grazed on lucerne, and some pigs in a recent test suffered severely, but it did not prevent them from making economical gains. Until definite experiments have been taken, it would be advisable to suspend judgment.

Large Blacks.—Black pigs have been favoured in South Africa because of their resistance to sunscald. The Large Black is a hardier type of pig, and only under exceptional treatment does it show any signs of sunscald.

On the other hand, Large Blacks do not have the quality of the Large Whites; they are at times rather short and heavy in the shoulders, and show "seedy cut".

The cross between the Large White and the Large Black has white hair and white and black skins. They are probably more resistant to sunscald and have crossbred vigour. The cross will probably be a favourite one and is quite suitable for bacon.

The Tamworth.—There is only one other breed which at present merits consideration and that is the Tamworth. This breed of pigs is excellent for bacon, but lacks the prolificacy of Large Blacks and Large Whites. They are resistant to sunscald. The only country outside of England where they have become of commercial importance is Canada. If results of experiments with white pigs should prove unfavourable to Large Whites, it is suggested that Tamworths be imported from Canada. An attempt should be made to find out how they have developed in Canada during the War. Canadian bacon production was increased enormously to replace the loss of Scandinavian bacon. If the Tamworth has been carefully bred and improved, it might be of great value to us. It is not clear to what extent the cross with the Large Black develops "seedy cut".

Except that the cross is black, the Tamworth × Large Black is an excellent bacon pig. If the South African market demands a very lean type of bacon, the Tamworth × Large White might also be a success.

The question of breed will be referred to again under marketing.

Feeding.

This is too large a subject to be fully dealt with here. The grade of a bacon pig is largely controlled by the feeding during the last 6 weeks. The more immediate problems requiring investigation are:

(*a*) White or yellow mealie meal in the final fattening. Yellow mealie meal is considered to be more suitable than white for young pigs owing to increased vitamins. Danish curers object to pigs finished on a large proportion of mealie meal. It is not clear if this applies only to yellow mealie meal or to white as well. If the germ of white mealies is removed, does the objection to mealies fall away?

(*b*) Acorns. What is the effect of acorns on texture of meat and colour of fat? Does soaking and draining of water remove the objection, if any? Does decorticating help?

(*c*) South African fish meal. Does it taint if fed during the final feeding?

(*d*) If a pig has had ample protein and is well grown before fattening, is any protein-rich supplement necessary in the final feeding? If so, what are the most suitable protein supplements?

(*e*) What proportion of barley, rye meal, etc., is necessary to improve carcases to first grade?

Marketing may be divided into two sections, viz. (*a*) marketing of pigs, and (*b*) marketing of the finished products.

(*a*) The most satisfactory market for bacon pigs would be a co-operative bacon factory. To be economical, a bacon factory should have a steady supply of at least 1,000 pigs per month. In a smaller factory the overhead charges are too high. Pigs should be purchased on a dressed-weight basis and graded.

A Government official should be appointed who would perform the following duties, viz. (i) check the weighing of carcases; (ii) grade the carcases; (iii) condemn carcases unsuitable for human consumption, and (iv) check all sales to avoid second grade being sold as first, etc. This officer should be responsible to the Government Control for the general hygiene of the factory. Where only one class of animals is being inspected, it would not be necessary to have a qualified veterinary surgeon. On a salary of £500 per annum this would represent a cost of less than 1 per cent. on pre-war values of bacon pigs at 6d. per lb. In any dispute in regard to condemnation of carcases for health reasons, the dispute would be referred to the district veterinary surgeon, who from time to time should check the work. Disputes in regard to grades would be referred to a senior inspector of the Animal Husbandry Department.

The most difficult problem with which we are concerned is the fixing of the *grades* and the recommendations in regard to feeding that we should have to make to farmers in order that a large percentage of his pigs could grade first. This problem again can be divided into the following headings:

(i) *Breed or Cross.*—Can a pure-bred Large Black ever be a first grade? Can any black pig?

(ii) *Age.*—Can a pig over, say, 8 to 9 months be a first? Is there any accurate test to ascertain the age, e.g. by the bones, teeth, etc.?

(iii) *Feeding.*—A standard system of feeding, especially during the final fattening should be advised. Since mealies are usually the cheapest grain, to what extent can they be fed?

(iv) *Grading.*—This is largely a question of length and thickness of fat. A short pig might grade low on account of lack of length, but if cut up and sold in pieces the ham, etc., might be first grade. How is this to be adjusted?

(*b*) Marketing bacon and ham and small goods. In South Africa, bacon and ham have been consumed mainly by the well-to-do classes of the community. In Europe and the U.S.A. bacon and ham are largely consumed not only by wealthy people, but also by the poorest classes. In fact, the products of the pig are almost the only meat consumed by the poorest classes.

South African bacon factories have been handicapped because of the small demand for the cheaper cuts and the " small goods ". If South African bacon factories are to be the success that they ought to be, an effort should be made to educate the poorer classes to appreciate the value of bacon and ham.

To-day, when there is a meatless day which does not apply to ham and bacon, is a particularly suitable time to get the public to appreciate the economic importance of bacon and ham. The fullest use should be made of the offals in various forms of sausage and polonies. On the Continent greater use is made of the blood and offal than in England, and it would probably be advisable to have a man trained on the Continent in charge of the small goods.

In South Africa our best pigs are cured as " Wiltshire Sides ". This is probably satisfactory for well-trained grocers, but a " Wiltshire Side " is very difficult for the ordinary small storekeeper who has had no training, to handle. For this reason it is probable that other forms of bacon would be more suitable for storekeepers doing a small trade.

A Bacon Industry.

The above is a short summary of the principal problems in the establishment of a bacon industry in the Western Cape Province.

At the present time we have an excellent opportunity of establishing such an industry owing to the enforced protection brought about by war conditions. From the above it seems clear, however, that a prompt investigation of these problems is needed. When we are certain of the correct answers, we can lay down definite lines of procedure so as to assure for the producer who is prepared to take the trouble to breed the best class of bacon pigs, a fair price for his product, and at the same time guarantee the consumer that when he purchases bacon of the top grade and pays top prices, he will receive a bacon equal to that which has been imported from Denmark in the past.

One of the most important developments in the breeding of pigs in recent years was the testing of breeding sows by feeding 4 of their litter under control conditions. If the results of the development and economic use of food were satisfactory, the sow was registered for pure breeding. Something similar will have to be done in South Africa if we are to make the same progress that has been made in other countries.

At the present time we are faced with two serious difficulties:

(1) In Denmark commercial pig breeders all follow the same methods. It is therefore easy to lay down a standard ration and feed

the pigs on that ration from weaning to finishing. At present we do not know enough to lay down a standard ration, and, if we did, it would be very difficult to hold to the standard.

(2) In South Africa a great deal of use is likely to be made of grazing to reduce the cost of production. Pigs which are fed in a sty on a heavy ration from weaning, might be too short and fat when they reach bacon weight. The same pigs, if run out on grazing and taking 4-6 weeks longer to reach bacon weight might be just right or even too lean.

Although we will have to adopt some such system of selection and registration as has been adopted in Denmark, a great deal of preliminary work will nevertheless have to be done first to settle the problems mentioned in this article.

Poisonous and Non-Poisonous Algae (Waterblosm, Scum) in Dams and Pans:—

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and dragged to and fro over the dam until the calculated quantity has been dissolved.

If copper sulphate is used in drinking water in the quantities prescribed above, and even as much as 1 lb. in 100,000 gallons, it will have no harmful effect on humans, animals or plants (vegetables, cereals, etc.).

The Control of Cabbage Pests:—

[Continued from page 468.

If a pound of yellow soap dissolved in water is added to every 20 gallons of the spray mixture, the spray is greatly improved and more effective.

At the present time nicotine is almost unobtainable and very expensive, but growers can easily prepare their own tobacco extract from scrap, which is not marketable.

The snuff type (Virginia) tobacco is preferable because of its high nicotine content. The scrap is cut up into half-inch lengths and treated as follows:—Soak 1 lb. of the cut tobacco in 1 gallon of hot water for a period of 24 to 48 hours, until the liquid extract has the colour of strong tea. Do not boil the mixture during the extracting process as the volatile nicotine will be driven off. Strain the leaves from the liquid and use the latter immediately without further dilution.

Last but not least, cabbage growers must always practise a good system of rotation and clean cultivation. The latter is essential, as old seedbeds and lands form a prolific source of reinfestation since the above-mentioned pests will keep on breeding on old plants and the remains of harvested plants unless these are immediately destroyed.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 23 JULY 1944 No. 263

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* Price Review for May 1944.

Slaughter Stock.—The new scheme for the marketing of meat in nine urban centres came into force on 10th May 1944 and all stock sales in urban areas have thereby been eliminated. Henceforth sales will be made at fixed prices according to grade and weight.

The reader is referred to an article appearing elsewhere in this publication in connection with the scheme.

Fodder and Grain.—Supplies of dry beans and peas increased during the past month. On the Johannesburg market the supply of dry beans was nearly doubled, but as a result of a good demand prices of all kinds of beans except cowpeas showed a further advance, viz., kidney beans from 44s. to 54s. 5d. per bag; small white from 47s. 7d. to 52s. per bag; speckled sugar from 71s. 6d. to 71s. 8d. per bag; and yellow sugar from 67s. 8d. to 75s. 1d. per bag.

Smaller supplies of dry lucerne and teff hay realized higher prices on the Johannesburg market than during the previous month. Prices of lucerne increased from 5s. 3d. to 6s. 8d., and of teff from 3s. 8d. to 4s. 4d. per 100 lb. Lucerne was fairly plentiful on the Cape Town market, and prices remained unchanged, viz., 7s. 3d. per 100 lb.

Vegetables.—Vegetables were well supplied on most markets. Cauliflower and cabbage, in particular, were plentiful and realized good prices. Green peas were scarce on practically all markets.

Potatoes.—The supply of potatoes on all markets was inadequate to meet the continuous keen demand. Practically all National Mark potatoes on the Johannesburg market were sold at a fixed maximum price of 30s. per bag. Rationing on nearly all markets was necessary.

* All prices mentioned are averages.

Fruit.—Deciduous fruit was supplied in smaller quantities. The most important varieties were apples, pears and grapes, and were sold at high prices.

On all markets the supplies of citrus fruit increased, and as a result of a keen demand experienced brisk sales.

Tropical fruits consisted chiefly of pawpaws and avocados. Avocados sold well, but pawpaws of poour quality experienced dull sales.

Tomatoes.—Insufficient quantities of tomatoes of poor quality were supplied on some markets. On the Johannesburg and Cape Town markets, however, the supplies were moderate to heavy. Prices on the Johannesburg market accordingly showed a slight decline.

Eggs and Poultry.—In general, eggs were scarcer. On the Johannesburg market new-laid eggs were sold at an unchanged average price of 3s. 1d. per dozen. The supplies of poultry were smaller and sold well.

Index of Prices of Field Crop and Animal Products.

As shown elsewhere in this issue, this index increased from 162 in April 1944 to 167 in May 1944 (basic period 1936-37 to 1938-39).

The most important price increases occurred in the following groups:—

1. *Summer cereals* from 167 to 183 as a result of the fixation of maize prices on a higher level for the 1943-44 crop.
2. *Hay* from 132 to 158 as a result of an increase in the prices of lucerne and teff hay.
3. *Other field crops* from 262 to 289 mainly as a result of a price increase in the case of potatoes, dry beans and onions.
4. *Dairy products* from 144 to 169 as a result of the winter subsidy which came into force on the 1st May 1944. (For particulars in this connection see article elsewhere in this issue.)

The most important price declines occurred in the case of:—

1. *Slaughter stock,* namely, from 170 to 166. Fixed producers' prices under the new meat-control scheme came into force on the 10 May 1944. (For particulars see article elsewhere in this issue.)
2. *Poultry* and poultry products, namely, from 279 to 273 mainly as a result of a decline in the prices of turkeys. Other poultry products remained more or less unchanged as compared with previous months.

The New Meat Scheme.

IN October 1942 a certain amount of control over the meat industry was exercised for the first time, viz., the fixing of maximum wholesale and retail prices for the various grades of beef, mutton and lamb in four areas, namely Witwatersrand, Pretoria, Cape Town and Durban. Producers' prices were not fixed as the sale of livestock was on a live-weight basis, except on the Durban market. An indication was, however, given by the Price Controller of the prices which producers ought to receive in order to enable the trade to maintain the fixed wholesale and retail prices. These prices were amended

from time to time according to the available supplies and increasing demand.

Notwithstanding these control measures and the expectation that price fixation in the areas mentioned would in itself stabilize the position in the remaining markets, prices nevertheless rose above the indicated producers' prices. The result was that the trade was unable to maintain the fixed maximum wholesale and retail prices. Although excessive advances in the prices of meat were to some extent prevented, these measures nevertheless did not succeed in stabilizing the position, and in June 1943 a Commission was appointed to investigate the whole meat position and to make recommendations. On the basis of the findings and recommendations of this Commission, a new and more comprehensive meat-control scheme was drawn up and came into operation for the first time on 10 May 1944.

In the main this new scheme amounts to the following:—

(1) It is applicable in the nine most importan urban areas, viz., Witwatersrand, Pretoria, Durban, Pietermaritzburg, Bloemfontein, Cape Town, Port Elizabeth, East London and Kimberley. It includes the control of all kinds of meat and meat products in these areas.

(2) All livestock auction sales in the controlled areas will be abolished, but auctioneers may act as agents for producers and the existing channels of trade will be disturbed as little as possible. Auction sales of livestock in rural areas, i.e., outside the controlled areas, will be continued.

(3) All stock sent to these areas for slaughtering must be sold to the Controller of Food, and payment to producers will be on a basis of the *warm dressed weight* of the animals at fixed prices according to grade.

(4) Wholesale and retail prices, as well as producers' prices have been fixed for these areas.

(5) No slaughter stock may be sold within these controlled areas or removed from there without a permit from the Livestock Industry Control Board.

Producers' prices for the various classes of livestock have been fixed as follows on a *warm dressed-weight* basis:—

Slaughter cattle.—Prime, 62s. 6d.; grade I, 53s. 6d.; grade II, 46s.; grade III, 38s.; grade IV, 25s. per 100 lb.

Lamb.—Super, 11⅜d.; prime, 9⅜d.; grade I, 8⅞d. per lb.

Mutton.—Prime, 8⅞d.; grade I, 7⅞d.; grade II, 5⅞d. per lb.

Pigs.—Porkers: grade I, 10¾d.; grade II, 9¾d. per lb.

Baconers: grade I, 10¾d.; grade II, 9¾d. per lb.
Sausages: 8¾d.; larders, 7½d., and inferior pigs, 5d. per lb.

The prices for slaughter cattle given above are for the Witwatersrand and Pretoria. For Cape Town the fixed prices are 2s. 6d. per 100 lb. more, while in the other controlled centres it is 1s. per 100 lb. less. The above prices of lamb and mutton are as fixed for Port Elizabeth, East London, Bloemfontein and Kimberley. For the Witwatersrand, Pretoria and Cape Town the prices are ⅜d. per lb. higher, and for Durban and Pietermaritzburg ⅞d. per lb. higher.

For full particulars regarding wholesale and retail prices, see *Government Gazette* No. 3339 of 9 May 1944.

Over and above the fixed producers' prices shown above, producers will also receive for the hides, skins and offal approximately 5s. per 100 lb. in the case of cattle, and 1d. per lb. in the case of

sheep after allowance has been made for marketing fees and slaughtering costs.

Furthermore, the above producers' prices are on a *warm* dressed-weight basis, i.e., the ordinary shrinkage of about 3 per cent. will not be deducted from the weight of the producers' stock. Calculated on a cold dressed-weight basis, this means an average of a further 1s. 6d. per 100 lb. beef (based on a 500-lb. carcase at 60s. per 100 lb.), and approximately ¼d. per lb. mutton (based on a 36-lb. carcase at 10d. per lb.).

The intention is to maintain consumers' prices and trade prices on the same level throughout the year, but producers' prices for slaughter cattle will be increased during the second half of the year to compensate for increased feeding expenses, and will be decreased again as soon as offerings start to increase during the plentiful season.

The most important function of the Livestock Industry Control Board under this scheme will be to ensure that supplies offered are efficiently regulated and distributed amongst the various centres. For this reason it has been determined that no livestock for slaughtering purposes shall be moved into or out of these controlled areas without a permit issued by the Board on application from the producer or the agent acting on his behalf. For this purpose the Board has now opened offices in each of these centres.

The levy payable to the Board on all livestock slaughtered at municipal abattoirs remains in force. This levy has been decreased, as from 1 August 1943, from 2s. to 6d. per head for cattle, from 6d. to 2d. per head for calves under 6 months, and from 3d. to 2d. per head for sheep. The levy in the case of pigs will be announced shortly. Previously there was no levy on pigs slaughtered.

Indian Jute Production, 1943.

THE second estimate places the 1943 jute area in India at 2,602,100 acres and the crop at 2,780 million lb. as compared with an acreage of 3,332,600 acres for 1942. The average output for the years 1937-1941 was 3,513 million lb.

The reduction in acreage under jute was due to a decline in the demand for jute owing to the war. Furthermore, a large proportion of the soil under jute has lately been put to rice in order to supplement the country's requirements of this essential food commodity. Formerly India obtained a large proportion of her rice supplies from Burma and China, this source of supply now, of course, being cut off.

Present estimates indicate that approximately 4,550 million pounds will be available for consumption during 1943-44, or considerably less than in 1940-41 when the unusually large crop of nearly 5,269 million pounds added to a carry-over of 920 million pounds made more than 6,000 million pounds available during that year.

On account of this shortage it has recently been announced that from 1 July 1944 all sales of jute will be controlled, but the question of allocation of quotas for the various countries is still being considered.

Argentine Wheat and Maize Crops 1943/44.

Wheat.—The 1943-44 Argentine wheat crop is estimated at 290 million bushels which is almost a record, being exceeded only by the 1940-41 crop of 299 million bushels. The 1942-43 crop was 235 million bushels.

Maize.—The first official estimate places the 1943-44 Argentine maize crop at 41,780,000 qrts. of 480 lb. as against a production of 8,922,000 qrts. for 1942-43 and 41,556,000 qrts. for 1941-42.

Prices of Dairy Produce, 1944—Winter Season.

Butterfat.—As decided by the Dairy Industry Control Board, a subsidy of 3d. per lb. will be paid on all grades of butterfat delivered by producers to creameries as from 1 May 1944 and until further notice.

The prices on which this subsidy will be paid, are 1s. 7d., 1s. 5d. and 1s. 3d. per lb. for 1st, 2nd and 3rd grade butterfat, respectively, so that producers will receive 1s. 10d., 1s. 7d. and 1s. 5d. per lb. for 1st, 2nd and 3rd grade, respectively, as from 1 May 1944 and until further notice. This is 1d. per lb. more in each case than the corresponding prices paid to producers during the previous winter (viz., from 1 May 1943).

The wholesale and retail prices for butter as fixed by the Board from 1 February 1942 remain unchanged, viz., as follows:—

	1st Grade.	2nd Grade.	3rd Grade.
	s. d.	s. d.	s. d.
Wholesale price............................	1 8	1 6	1 4
Retail price................................	1 10	1 8	1 6

On all *cheese milk* delivered by producers to cheese factories the Board has decided to pay a subsidy of 2d. per gallon (or 5·5d. per lb, butterfat contained therein) as from 1 May 1944 and until further notice. Producers will therefore receive 11d. (9d. plus 2d. subsidy) per gallon of cheese milk as from this date. This price is the same as the corresponding price paid to producers during the previous winter (from 1 May 1943).

The wholesale and retail prices for cheese as fixed by the Board as from 1 May 1943 also remain unchanged, viz., as follows:—

	1st Grade.	2nd Grade.	3rd Grade.
	s. d.	s. d.	s. d.
Wholesale price............................	1 4	1 3	1 4
Retail price................................	1 7	1 6	1 6

Milk for Condsensing Purposes.—The Board has also fixed the producers' price of milk for condensing purposes at 1s. per gallon or 2s. 9½d. per lb. butterfat contained therein, which is also the same as the corresponding price fixed for the previous winter season (from 1 May 1943).

The fixed summer price was 10d. per gallon or 2s. 4d. per lb. butterfat contained therein.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops. (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39	92	107	96	89	79	102	106	92	94
1939-40	86	107	77	95	115	105	106	89	103
1940-41	109	113	106	156	102	108	110	104	108
1941-42	121	134	143	203	102	131	134	145	123
1942-43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158
February	168	183	134	188	122	144	176	235	158
March	167	183	124	179	122	144	174	240	157
April	167	183	132	262	122	144	170	279	162
May	183	183	158	289	122	169	166	273	167

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet-potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1st July to 30th June).	CABBAGES (Bag). (a)			CAULIFLOWER (Bag). (a)			TOMATOES (Trays 15 lb.).			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg. N.M. No. 1.	Johannesburg. Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940-41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941-42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-43	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2
February	7 5	7 8	22 2	6 8	—	—	4 7	1 9	2 9	2 3
March	13 4	10 6	25 7	10 4	8 11	15 6	6 8	3 3	2 5	2 5
April	11 3	10 11	22 8	9 1	8 5	12 2	5 11	2 10	3 1	2 4
May	11 11	7 10	18 0	10 5	8 2	13 10	5 6	2 10	3 8	2 5

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb. Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1st July to 30th June).	Eggs.			Fowls (Live, each).			Turkeys (Live, each).		
	Johannesburg, New Laid. Per Dozen.	Durban, New Laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942-43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 8
1944—									
January	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11
February	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March	2 10	2 9	19 10	4 1	4 11	4 7	13 5	18 3	13 4
April	3 2	3 5	24 5	4 2	5 3	4 1	15 0	17 0	13 8
May	3 2	3 6	24 9	5 0	5 5	4 2	13 8	15 8	13 11

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.).			Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.).		Dry Beans (200 lb.). bags.		
	Johannesburg (a).		Cape Town 1st. grade.		F.o.r. Producers Stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cow Peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2
February	5 2	8 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March	4 11	8 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6
April	5 3	4 6	—	3 9	17 9	17 7	71 6	38 9	44 0
May	6 4	3 9	7 3	4 4	18 0	18 6	71 8	37 11	54 5

(a) Municipal Market.
(b) Seasonal year for Kaffircorn 1st June–31st May; Dry Beans 1st April–31st March; Lucerne and Teff 1st July–30th June.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season (1st July to 30th June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade I.		Natal.	O.F.S.	Transvaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939-40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940-41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941-42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942-43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 6	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	18 1	14 10	11 6
April	23 1	21 11	30 2	30 4	29 9	25 11	28 4	30 2	24 0
May	27 10	26 7	30 7	29 6	29 4	22 10	30 0	28 10	26 3

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

Season. (1st July to 30th June).	Onions (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johanburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939-40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941-42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942-43	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June	17 3	17 4	15 8	18 1	12 0	18 9	8 5	8 6	9 2
July	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
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February	12 7	14 0	7 10	11 7	12 9	13 9	15 8	10 10	11 6
March	14 4	14 10	11 1	15 0	13 5	15 1	12 11	8 6	10 10
April	16 6	16 11	13 7	17 0	14 0	18 2	12 6	8 8	9 8
May	17 2	19 10	15 6	19 7	20 3	21 7	12 3	13 5	9 6

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[*Photo on Cover by S.A.R. & H.*]

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—*The Tariff for Classified Advertisements is:* 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmers' Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

Vol. 19 AUGUST 1944 No. 221

Editorial:

The Future of Agricultural Club Work and Land Service.

JUST as it is gradually being realized what an important rôle agricultural club work plays in our primary education, so will land service in time be an important part of our higher education. Many examples can be found in history of great reforms and improvements brought about in education without the aid of educationists, departments of education or scholars. The Scout and Pathfinders' movement, for example, which is already established as an educational institution in all the countries of the Western Civilization, was not initiated by professionals but by a soldier, Sir Baden Powell.

Also in this country we find the following interesting development. During a quarter of a century educationists joined in the slogans "Back to the land", "Let the farmer stay on his farm", "Teach the farmer intensive farming methods", etc., and under their leadership recourse was had to "agricultural education". The subject nature study was changed to agricultural nature study; schools were provided with good agricultural implements, and school gardens and school lands came into being, alas only to disappear as promptly. In a few isolated cases, this trend in the development of our educational system resulted in the establishment of school farms, that is to say, educational centres where the ideal form of agricultural education for the children of our country is to be found.

Meanwhile, at the instance of a businessman and soon afterwards with the support of officers of our Department of Agriculture, a system of Agricultural Clubs was introduced and established in South Africa, viz., the self-farming system for children. This system of agricultural education, which aims at securing for each child his own little farm, is so well adapted to the farming tradition of our country, and is founded on such a sound psychological and educational basis, that it has already become well rooted in our schools. It must be admitted to-day that what educationists could not achieve, viz., a system of practical agricultural education for our school, has been successfully attempted by officers of the Department of Agriculture and Forestry.

Farmers and their wives used to encourage their children to farm for themselves. The farm-lad would, for example, get his own garden, his own lambs, his own horse, and the farm-girl her own flower-garden, her own poultry and her own home-work. The agricultural club system falls remarkably well into line with this farming tradition. The system is, moreover, founded on a sound psychological and educational basis, as due account is taken of the disposition of the child. This is a hobby which can be of great benefit to the child—it has a farm of its own and an industry which it can supervise and control in its entirety and out of which it can itself make a little money.

It redounds to the credit of the officers of the Department

that they further planned and expanded these farming schemes, thereby gradually developing the practical and applied agricultural education of our schools. During school hours the children acquire a theoretic or scientific knowledge of the subject, which at school is called nature study or agricultural nature study or physical science or agricultural science. In practice and in the applied form it is called agricultural club work or self-farming. The teachers at our schools to-day act as the leaders of agricultural clubs and agricultural club work, whereas the agricultural experts, with their schemes and information, their instructions and inspections ensure that the standard of work is maintained at a high level.

Agricultural club work is the ideal form of agricultural education for the child from about its tenth to its eighteenth year, when it has reached a sufficiently mature stage to undertake the greater social tasks which we call land service.

Land service is also in accord with the farming tradition and is also founded on a sound psychlogical and educational basis, being characteristic of a farmers' association. Farmers are sometimes bad friends with their neighbours but when the worst comes to the worst, and when an exceptionally big and important task is to be undertaken, farmers also know that they should assist one another and extend a helping hand. In this manner services of a permanent nature can be rendered to the country and nation. Land service offers people who have already had higher education and professional training ideal opportunities for obtaining firsthand information in a practical manner of the great problems of the country. Whatever is being prescribed and recommended by science, in particular the science of agriculture, is applied in practice by land service wherever possible. Land service acts as the laboratory of science and is the best agency agricultural science can employ for demonstrating and applying scientific knowledge. Our institutions for higher educlation can, therefore, render our country excellent service through land service and thus secure reciprocity between those institutions and the farming community.

Our schools have hailed and welcomed agricultural club work and taken it to their hearts. Will our universities, normal colleges, our institutions for advanced professional education also hail land service and take it to their hearts?

Thus far, five land service camps have been held where subjects such as soil erosion control and afforestation were studied in practice. In the Transvaal and Orange Free State there are already ten associations with a membership of approximately 500 in existence. People who are desirous of supporting this great movement can obtain further information from the Director of Animal and Crop Production.

(Dr. C. F. Visser, Organizer, Land Service.)

Subsidy on Lucerne Seed.

AS announced by the Secretary for Agriculture and Forestry on 16 February 1944, the Government has sanctioned a Lucerne-seed Subsidy Scheme for the growing of lucerne under dryland conditions. One of the provisions of the scheme provides that lucerne may be grown together with a grain crop, except in the Swartland, where the combined cultivation of these crops cannot be practised with success. It has been found necessary to emphasize this point, as some grain farmers were brought under the erroneous impression that they could not obtain a subsidy on lucerne seed for the purpose of sowing it together with their grain crops.

Control of Blowfly on Merino Sheep.

Classification of types as a measure in breeding less susceptible sheep.

A. H. de Vries, Entomologist, College of Agriculture, Grootfontein, Middelburg, C.P., and J. C. de Klerk, Sheep and Wool Officer, College of Agriculture, Glen, O.F.S.

THIS article is intended as a continuation of previous articles on blowfly control (see July and August 1943 issues of *Farming in South Africa*). For the better understanding of this article it is therefore of the utmost importance that readers should acquaint themselves with those articles first.

In the articles mentioned the main pre-disposing factors of susceptibility were discussed with particular emphasis on skin development in the crutch as one of the main factors making for susceptibility. At the same time it was pointed out that sheep which are plain in the crutch and of good formation (A type) are much less susceptible, if not entirely immune. Furthermore, it was stated that all sheep are classed in three different types, namely A, B and C according to the degree of their fold-formation (especially in the crutch) and their conformation, with special reference to their hind-quarters.

Three Various Types.

In what follows the reader will find a detailed description of the three various types, according to the Australian standard, illustrated by photos and drawings:—

A type.—(*a*) This type of sheep must be perfectly plain in the crutch, i.e. it should have no medial or lateral folds (photos 7 and 10—ram and ewe).

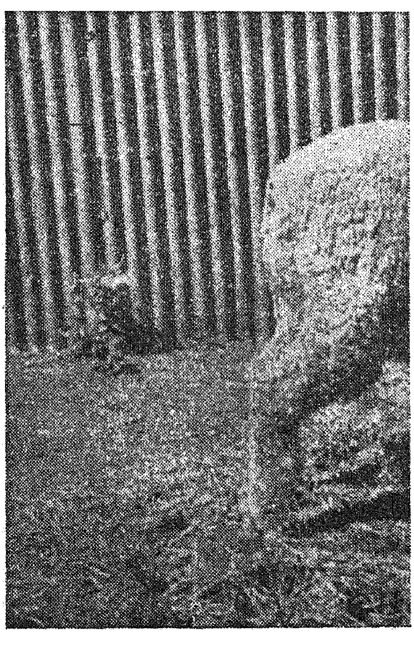


PHOTO 1.

(b) A further feature is broad hindquarters i.e. the animal should not be narrow between the aitch-bones.

(c) A third feature is well-fleshed hindquarters in the area direct under the anus (Photo 1 and Fig. 3). If the posterior is well-fleshed such defects as drooping or goose-rump (Photo 11 and Figures 1 and 2) will not occur.

The bare patch in the locality of the anus and vulva should be as large as possible (Photo 6). This aspect is most important and will be fully discussed later. Photos 1, 6, 7 and 10 and Fig. 3 represent pictures of rams and ewes of the A type.

B type.—In this type either small medial or lateral folds are permitted but not both in the same animal. If all other aspects relating to build conform to standard requirements, even striking lateral folds may be allowed, provided that such folds are some distance from the anus or situated low down. (Photo 3 reveals small medial folds near the vulva. In long-woolled sheep the presence of these folds can only be detected with some difficulty and such sheep should again be examined immediately after they have been shorn or crutched.)

As in the case of type A good conformation is essential for qualification but the following defects are allowed:—

(i) The animal may be narrower between the aitch-bones; the posterior and side may be less prominently fleshed than in the A type (Photo 2).

PHOTO 2.

(ii) The bare patch surrounding the excretory organs may be smaller than in type A, but it should always be as large as possible.

From the above it is clear that the B type is an intermediary one; it is either a poor A type or a good C type.

In Photo 3 for example two very small medial folds are shown. For the rest the ram has a very plain body and, but for this defect, would have qualified for the A type.

The ewe represented in Photo 4 again is classed as a B type since the pronounced lateral folds and even the small medial folds are

situated low down and consequently do not fall within the danger zone. Should any of these folds occur near the vulva or anus, as for example in the sheep shown in Photos 8 and 9, the animal would definitely be classed as a C type. If the animal should have had a narrow posterior conformation, she also would have fallen under type C, but as this region happens to be broad and the space around the anus and vulva smooth and the folds, although prominent, are not situated in the danger zone, she must qualify for type B.

It is admitted that some judges will class her under type C and the writers think they are right, especially since the ewe has in addition to these defects also folds on he tail. If, however, the tail had been docked at a length of 4 inches as is now being recommended, this defect too would have been eliminated.

PHOTO 3.

Generally speaking, farmers would be well advised not to cull such doubtful ewes from the very start for, if initial classing is applied too strictly, very few sheep will be left over because of the scarcity of A types in the ordinary flock. It is, however, desirable to cull this type of ewe also at a later stage in the development of the desired type of sheep.

Rams of this quality should, however, always be classed as a C type and consequently undesirable, since a ram exercises such a profound influence on the flock.

The ram represented in Photo 2 is also classed as a B type. The animal has a smooth crutch, broad posterior, large and strong conformation and could unhesitatingly be classed as an A type but for its large and undesirable tail. (This feature will be explained at a later stage).

C type.—In this type we find a large range of undesirable characters such as the following: prominent medial and lateral folds, especially near the anus (Photos 8 and 9); narrowness of the aitch bones; drooping or goose-rump, cow-hocks (see description in July 1943 issue of *Farming in South Africa*); hindquarters poorly fleshed

at the back (Photo 11, Fig. 1 and 2) and a small bare spot around the excretory organs. In addition this animal also shows other folds such as traverse folds which join the medial or lateral folds etc. (see *Farming in South Africa*, July 1943).

Photos 5, 8, 9 and 11 and Figures 1 and 2 all represent C types. Note the prominent medial folds which run into the tail folds of Photos 8 and 9, a most undesirable phenomenon, as indicated in the July 1943 article. In Photo 5 an otherwise beautiful ram is shown with a split tail.

Such C types are absolutely undesirable and should never be used as foundation stock.

PHOTO 4.

Undesirable Tail.

Skin development on the tail is most undesirable and should not be tolerated in rams of the A and B types. Rams with split (Photo 5) and big tails should not be used for serving purposes.

PHOTO 5.

As stated above, these tail defects may to some extent initially be tolerated in ewes, since the breeder's choice will usually be limited and most defects can be actually eliminated by docking at a length of 4 inches. Such ewes should, however, only be mated to good A type rams having no tail defects.

It should, however, be remembered that skin development on the tail—even in the case of long tails—will always be dangerous in the coastal belt and in the karroo at times of severe attacks when the climate is wet. (A detailed description of undesirable tails will appear in a later article on the Mules operation).

In the article of August 1943 it was clearly indicated that the A type was not particularly attractive to blowfly and that the B, and particularly the C types, were more liable to attack.

The necessity for applying selective breeding and developing immune sheep was stressed, it being particularly pointed out that the choice of the ram demands great care, since this animal exercises such a profound influence.

Experiments in Australia.

In Australia* it has been proved that skin devolopment in the crutch is a hereditary character and that breeding will definitely affect this phenomenon, as will appear from the following data:—

1.—A-type Rams Serving A-type Ewes gave the following Progeny:—

	A.	B.	C.	
	%	%	%	
Ewes	55	43	2	
Rams	82	16	2	
TOTAL	178 (69·5%)	74 (28·9%)	4 (1%)	— 256 sheep.

2.—B-type Rams Serving B-type Ewes:—

	A.	B.	C.	
	%	%	%	
Ewes	16	72	12	
Rams	51	41	8	
TOTAL	77 (33%)	131 (56·7%)	23 (9·9%)	— 231 sheep.

3.—C-type Rams Serving C-type Ewes.:—

	A	B.	C.	
	%	%	%	
Ewes	4	48	48	
Rams	12	53	35	
TOTAL	7 (8·3%)	42 (50%)	35 (41·6%)	— 84 sheep.

The above data indicate very clearly that skin development in the breach is a transmissible character and is therefore capable of being eliminated by breeding. Moreover, it is remarkable that when B types are mated the percentage B types in the off-spring is exceptionally high and that the percentage A types is even higher than the C type. A fact which is significant to ram breeders is that A-type rams mated to A-type ewes produce such a large percentage A-type lambs.

Moreover it is apparent that the mating of C types produces a very low percentage of A types.

These results prove the salient fact that, if good types are mated, the majority of the lamb crop will also be of a good type. They, therefore, emphasize the necessity for using the very best type of animal as foundation stock.

PHOTO 6.

* H. R. Seddon, H. G Belschner and C. R. Mulhearn, 1937, *Science Bulletin* No. 54, N.S.W. Department of Agriculture.

PHOTO 7.

Availability of A-type Rams in South Africa.

In view of the above data the question naturally arieses to what extent rams of the type A are available in South Africa and whether ram breeders are taking this important aspect into account.

The writers have decided to test the matter on one of the large ram sales held in Bloemfontein on 24 August 1943. The total number of rams tested amounted to 483 and the findings were as follows:—

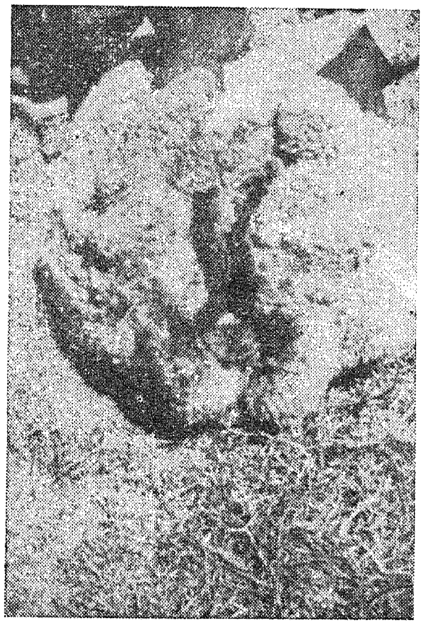


PHOTO 8.

At the inspection rams were divided into three classes, namely, A, B and C. The A class consisted of those with perfectly smooth crutches and broad hindquarters. This class again was sub-divided into A1 and A2 types.

A1.—This type, in addition to possessing the above-mentioned qualities also had well-fleshed hindquarters so that the anus area was, as it were, pressed forward to such an extent that it came

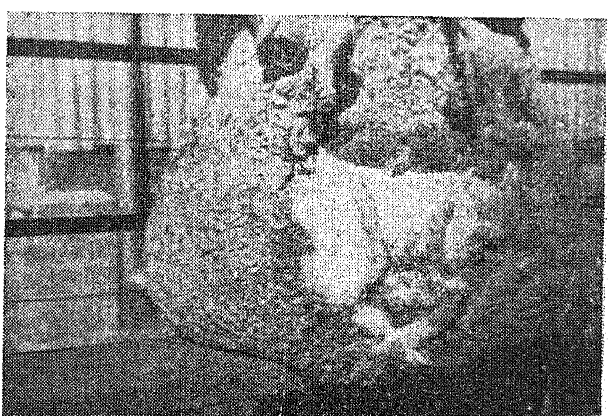


PHOTO 9.

into a straight line with the dock and the heels. This type must be regarded as most desirable.

*A*2.—This type possesses, besides those characters described under A or A1 also a large bare-skinned area which surrounds the anus and extends low down between the legs. This type is regarded as most desirable.

In the B type small medial and lateral folds were tolerated. Less broad hindquarters were passed and less emphasis was laid on a protruding anus. Smooth crutches, as described under A, which, however, are too narrow between the aitch-bones and not well fleshed also fall under this type and are regarded as less desirable.

*B*1.—As a rule no sub-division of this class is made, but it was felt that some sheep have the B crutch but in addition to that a desired character, namely, the large barren spot around the anus, as under type A2. These sheep are classed as B1. These rams may be regarded as desirable, and will be discussed later.

In the C type both prominent medial and lateral folds were allowed and as a rule the hindquarters were very narrow.

This type could be sub-divided in a similar way as the other types e.g. in subtypes comprising roof-rumped sheep or sheep with very small plain bare-skinned areas around the anus, but since the C type can definitely be regarded as undesirable, further sub-division was regarded as unnecessary. Such rams are regarded as entirely undesirable.

Medial folds are two folds running on both sides of the anus and, in many cases, merging with the tail folds (see Photo 9). Lateral folds again run parallel and are situated at the outside of the medial folds (see Photo 4). If the folds are wider than ¼ inch they are classed as prominent.

The following table represents a classification of the investigation of the rams at the Bloemfontein sale.

SHEEP IN VARIOUS TYPES.

Type of Sheep.	A. Most Desirable.	A.2. Most Desirable.	B.1. Desirable.	B. Less Desirable.	C. Undesirable.	A. Desirable.		B. Less Desirable.		C. Undesirable.	
	No.	No.	No.	No.	No.	No.	%	No.	%	No.	%
Plain-bodied	38	2	45	230	137	40	8·9	275	53·8	137	37·3
Moderate skin development...	1	0	0	0	24	1	4·0	0	0	24	96·0
Developed	0	0	2	0	4	0	0	2	33·3	4	66·7
TOTAL...	39	2	47	230	165	41	8·5	277	57·5	165	34·0

Results and Discussion.

The above data reveal the following remarkable facts:—

(*a*) Of the 483 rams, which were inspected 452 (or 93·5 per cent.) were classed as plain-bodied and only 6 or 1·2 per cent.) out of the 483 could really be classed as devoloped.

(*b*) Of the 483 rams which were inspected 41 only (or 8·5 per cent.) were desirable, whereas 277 (or 57·3 per cent.) were less desir-

able but nevertheless serviceable. On the other hand 165 (or 34 per cent.) were absolutely undesirable and, from a blowfly control point of view, unfit for service.

(*c*) Of the plain-bodied rams 8·9 per cent were most desirable animals, whereas of those showing moderate skin development 4 per cent. only were equally good and none of the developed ones could be approved.

(*d*) That desirable rams were found among moderately-developed animals.

(*f*) That of the 315 rams of the A and B types 47 (or 14·9 per cent.) showed the desired big bare-skinned area around the anus.

From a wool-production point of view, it was significant that all these rams, and particularly the A2's were of superior quality (stud rams); many of the B1's were sold at an average price of £25 each, which proves that they too must have been of a good type. This fact is recorded since certain breeders contend that a plain-bodied animal which is plain in the breech does not produce a compact fleece and that such wool is inclined to become loose and flabby.

PHOTO 10.

As previously emphasized, the size of the bare skin around the anus is one of the main factors in unsusceptible sheep. It stands to reason that the larger the size of the bare skin, the larger the space, and this usually indicates broad hindquarters. Consequently, we should aim at the breeding of this type of animal.

If it is taken into account that this desired character is found in 14·9 per cent. of the rams and that in the past breeders have paid no special attention to the crutch, we cannot but conclude that this factor, even though perhaps not pronounced, is present in every stud

and flock, and that by practising selective breeding it may be perpetuated in a considerably larger percentage of the offspring.

In the case of A2 type rams the diameter of the bare skin measures at least 4 inches and the broadest point was situated opposite the anus. In the B1 type it was somewhat smaller but in a few individual animals is was definitely equally large.

It should also be pointed out that the Department of Agriculture and Forestry has for years persistently advocated the breeding of plain-bodied sheep or rather discouraged the breeding of developed types. Breeders have thoroughly realized the necessity

PHOTO 11.

of concentrating on the former type and to-day we have the satisfaction of stating that 93·5 per cent of the rams offered by the Ram Breeders' Association at the one representative sale were of the plain-bodied type. A quarter of a century ago a plain-bodied ram was virtually a rare animal.

It is, however, thoroughly realized that the A type ram is still at a premium, but this should not discourage breeders, for the significance of crutch folds and conformation of hindquarters has only recently drawn attention and it is only now clearly realized what important predisposing factors folds, etc., are in susceptibility. (See *Farming in South Africa*, July, 1943.)

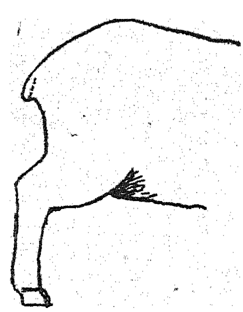


FIG. 1.

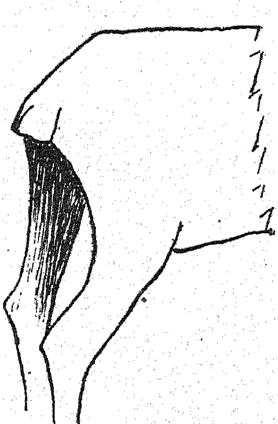


FIG. 2.

If, however, the policy advocated is persistently followed, we are equally sure that the B type and C type of animal will finally be practically eliminated.

Recommendations.

Recommendations for a breeding policy have already been fully and clearly explained in *Farming in South Africa* (see issue of August 1943), but attention should be focussed on a few further aspects:—

1. Experience has shown that some long-woolled rams which are classed as an A type actually fall under the B type, as can be seen after their wool has been removed. In a long-wooled animal it is difficult to detect small medial folds. In these circumstances it is always advisable at least first to crutch doubtful rams and thus dispel uncertainty.

2. Experience has further shown that it is most difficult in the case of long-woolled sheep to determine whether the Mules operation has already been performed and consequently there is a real danger that a ram of the B type which has been operated upon may be sold as an A type. It is a fact, however, that the expert or any experienced person will recognize such animals after careful examination. The above remarks apply mainly to the B type; it will almost be impossible to operate on a C type to such an extent that the animal can be regarded as an a type. Moreover, conformation which plays such an important rôle cannot be changed.

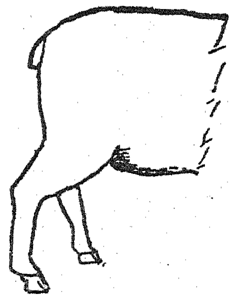


FIG. 3.

It is recommended that breeders should class their lambs at the age of, say, 4 to 6 months. The rams of the A and B types then receive their respective identification marks on the horn. On reaching the two-toothed or teeth-shedding age, they are again examined and each type given the final standard brand mark on the horn; noseprints may also be taken as an infallible method of identification.

The reason for the second examination is that further sk. development often brings about a change such as folds in the breec. which were not present at the age of six months.

In view of the above it can be argued that all rams should actually be classed only once, namely, at the two-toothed age or when they shed their first teeth. This is indeed a fact, but if no preliminary classing takes place, the farmer will be compelled to leave all his ram lambs entire until that age, whereas, if the rams are classed lambs, all C types may be culled and only A and B types retained.

Such selected rams can then be offered by breeders as certified A and B type rams.

Moreover, it is strongly recommended that shows, societies or associations should co-operate in this direction with a view to entirely eliminating the undesirable C type from our future flocks.

(Further articles on breeding and augmentation of classification of A, B and C types will be published from time to time as the extensive breeding test which is at present being carried out at Grootfontein, progresses).

Early Vegetables in Cold Areas.

E. G. L. Smith, Lecturer in Horticulture, College of Agriculture, Glen.

IN districts subject to early and late frosts it is always a problem to have tender vegetables far enough advanced for planting out in spring in order to obtain the advantage of good prices on the early market. For instance, after the Eastern Transvaal tomatoes are off the Orange Free State markets there is a definite lull before the Orange Free State tomatoes come on the market. As a rule these tomatoes do not come on the market before late in December, and they fetch good prices only for the first week.

The following are a few practical suggestions for the production of tender vegetables early in the season:—

At Glen College of Agriculture early tomatoes have ripened by the 24th October. This is exceptional, but it is not difficult to have ripe tomatoes by the middle of November.

Tomatoes, chillies and egg fruit can be sown in tins on a warm stoep, in frames or on a hot bed as early as the beginning of June. When the young plants are one inch high they can be pricked out to 25 in a tin where they can remain until they are three or four inches high. A few special ones can be planted in single tins sunk into a deep frame and grown until they have green fruit on them when they can be transplanted with the full ball of soil on them into the open ground as soon as all reasonable fear of frost has passed. These large plants take to the soil readily and the green fruit ripens quickly. This method is only suitable for a limited number of plants, as frame space is usually the limiting factor. These early fruits usually give good cash returns. Growers able to construct small brick frames would be well repaid for their labour and expenditure.

Another good method of raising early vegetables such as tomatoes, squash, cucumbers, marrows, etc., is to put four bricks on the soil in the form of a square, sow the seed in the centre and cover with a piece of glass; when the young plants are well established, the weakest ones must be removed.

Care of Tender Plants.

For planting out tender vegetables in beds cover them with hot-caps, two pieces of glass fixed together in a wire frame, or use cloches or bell jars and uncover them during the day in order to get rid of condensation and to prevent damping off.

At this college early tender plants were raised in a portable frame on a hotbed. To those who can obtain horse, donkey, or mule manure this is a very simple and inexpensive method of raising early seedlings and providing them with sufficient warmth to protect them from frost.

A hotbed can easily be made when one has a small portable frame. The manure must be packed up in the form of a square and the frame put on top. The manure must be two feet wider than the frame. Sand or fine soil should be put on top of the manure before placing the frame in position.

One essential point in stacking the manure is to tease out the strawy stable manure with a fork to enable it to bind properly. As soon as the temperature of the manure falls to 80° Fahrenheit, seed may be sown in boxes filled with sandy soil. These boxes are then placed on the hotbed and the frame kept closed. As soon as the first sign of germination is seen, the frame must be opened during the day to give air and to dry off condensation which collects

[*Continued on page* 502.

Loss of Mineral Nitrogen due to Leaching in a Citrus Orchard.

A. J. v. d. Merwe, Division of Horticulture, Pretoria.

THE fact that nitrogen compounds undergo changes both in the soil and in the plant renders the nitrogen nutrition of a plant particularly complicated. Nevertheless, nitrogen remains one of the most important elements in the soil, since it is indispensable for the successful growing of plants and crops.

The effectiveness of mineral nutrients is largely determined by two important factors, viz., fixation and leaching. Fixation is mainly responsible for the conversion of soluble to insoluble forms, as, for instance, in the case of phosphates. It constitutes a serious problem in heavy clay soils. Leaching, again, is responsible for the loss of soluble nutrients as a result of incorrect irrigation and heavy rains and constitutes a serious problem in sandy soils, the moisture-retaining capacity of which is very low.

Degree of Leaching.

In order to determine the degree of leaching in such soils, an experiment on nitrogen nutrition in young citrus trees has now been in progress for several years in the Rustenburg district. The results hitherto obtained induce the writers to call the attention of growers to a few points which, in view of the prevailing conditions and the acute shortage of fertilizers, may be found useful for obtaining the best results in the circumstances.

The fact that leaching in that particular area must be considerable, is very clearly shown by the serious lack of nitrogen after heavy summer rains, no matter in what form it is applied.

Mechanical analysis has shown that the soils are composed of 49·8 per cent. coarse sand, 29·9 per cent. fine sand and 21·2 per cent. clay. The soil can therefore be classified as a sandy soil and is representative of the area. With a few exceptions, the citrus plantings in the area are all on this type of soil.

The water-retention capacity of sandy soils is very low due to their low clay content, and for this reason they are sometimes referred to as dry soils. The loose structure of the soil allows water to pass through very easily. Incorrect or excessive irrigation would completely nullify any advantages which might otherwise be obtained by excellent fertilizing.

Research work to determine the degree of leaching was started in July 1940. By making use of bare plots, the nitrogen cycle and the loss of mineral nitrogen can be determined simultaneously. Where irrigations were necessary the amount of water applied in each irrigation was taken as representative of the normal irrigation practice applied in the adjoining orchard.

Nitrogen Status under Control Conditions.

In plates I and II a summary is given of both the control and the treated plots for two successive seasons; it is sub-divided according to the various treatments. Figures 1, 2, 3, 4, represent the various treatments which are as follows:—

1. Control plot.
2. Nitrogen applied in the form of ammonium sulphate.
3. Nitrogen applied in the form of ammonium sulphate and lime.
4. Nitrogen applied in the form of calcium nitrate.

Plate I.—Loss of mineral nitrogen due to leaching, 1941 season.

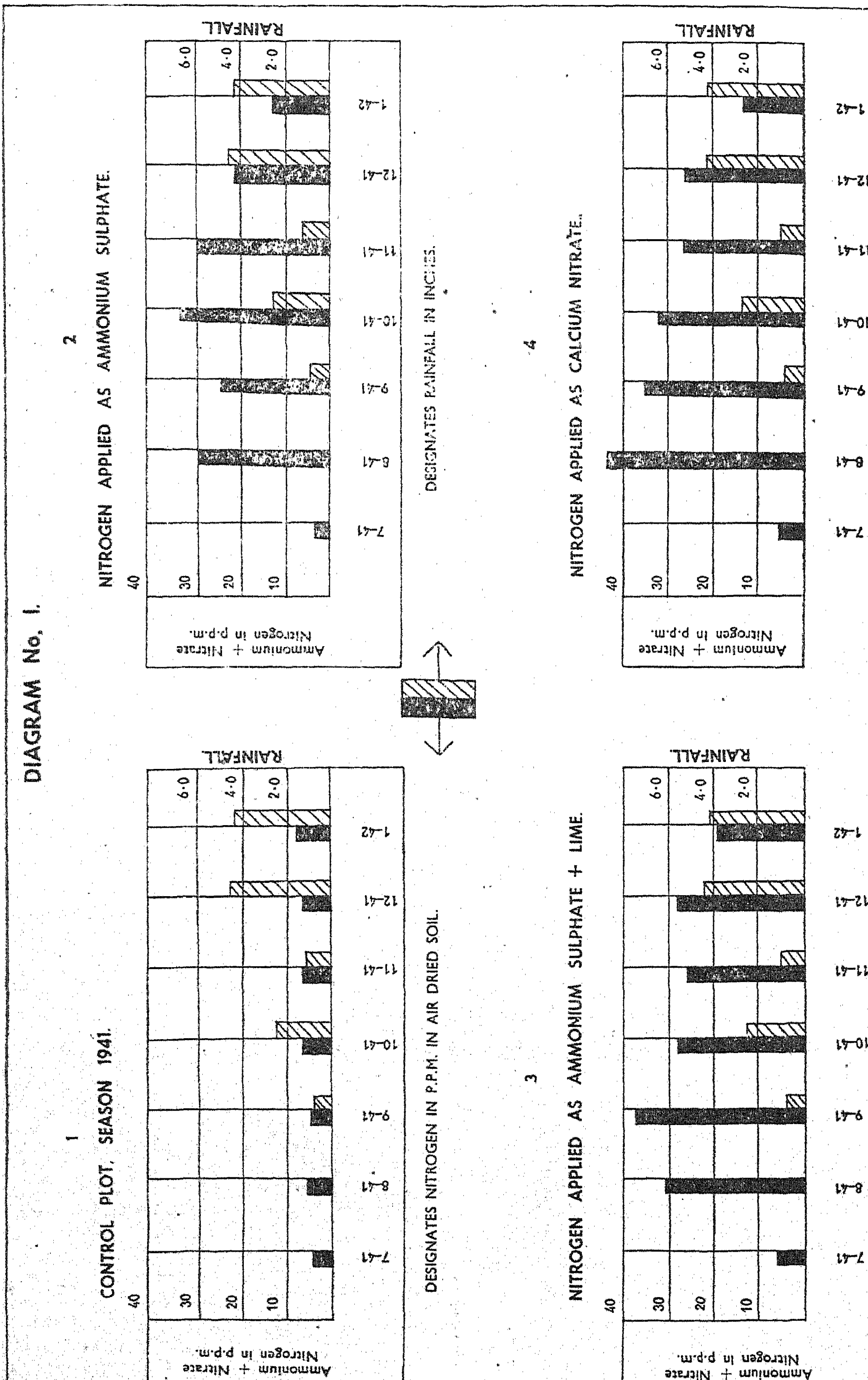
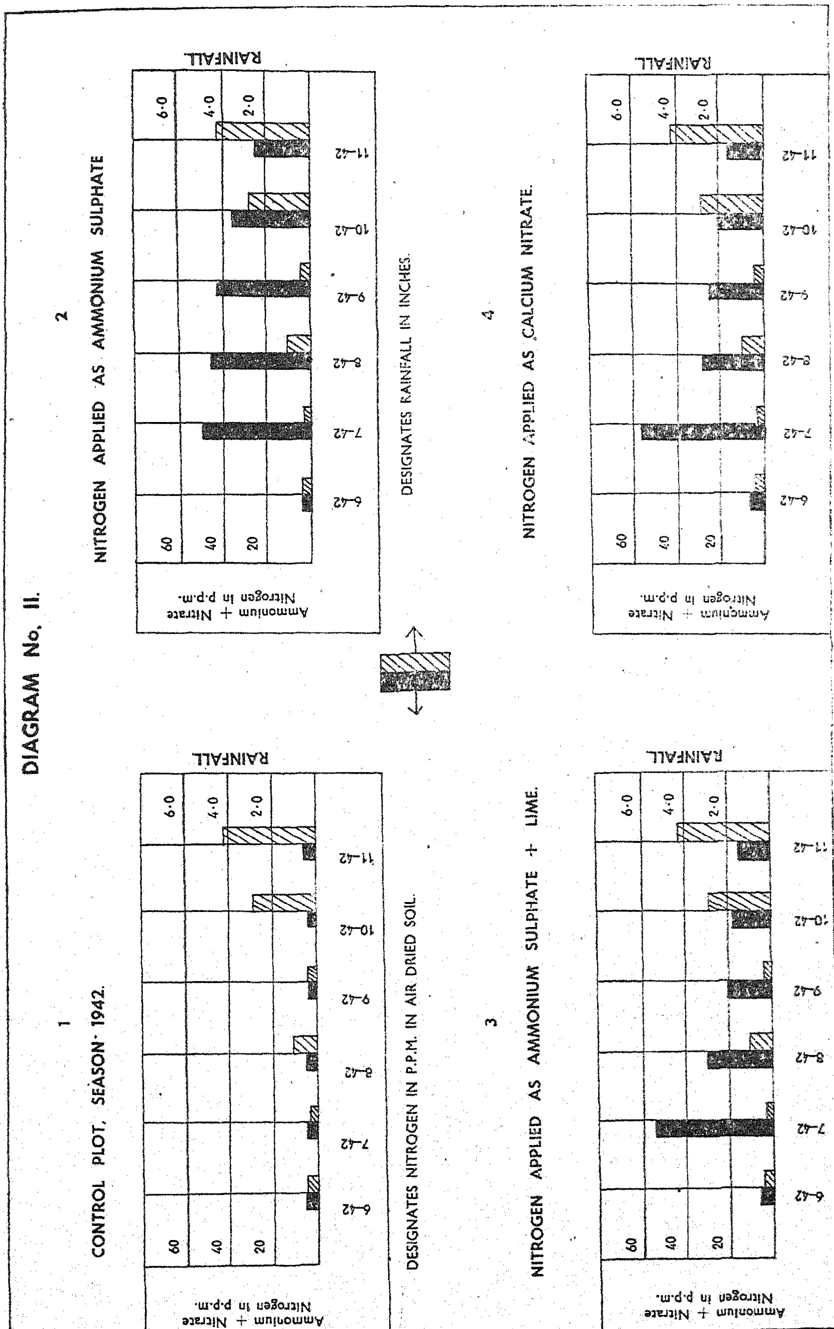


Plate II.—Loss of mineral nitrogen due to leaching, 1942 season.



The average concentration of mineral nitrogen in p.p.m. (parts per million) of the first, second and third foot of soil, can be compared by reference to the figures on the left side of the plates. The rainfall in inches is given on the right side of the plates.

It will be noted from the plates that there was a large variation in the rainfall for the two seasons. The 1941 season was much drier at the beginning than the 1942 season. The loss of nitrogen was also more gradual in 1941 than in 1942.

Furthermore, it will be noted that immediately after application the mineral nitrogen increases, to decrease again as the season progresses. It stands to reason that a gradual decrease in the nitrogen concentration under orchard conditions must be expected as a result of absorption by the roots. Under present conditions the abnormal loss can only be ascribed to leaching.

When the various forms of nitrogen, as applied, are compared, it will be noted that the readiness with which they are absorbed by the soil, hardly leaves any choice, since the results show that the downward trend of the nitrogen is very pronounced after each irrigation.

It is a well-known fact that nitrate-bound nitrogen readily moves about in the soil and consequently easily gets lost where excessive irrigations are applied or where soil conditions are very favourable for leaching, especially on sandy soils.

The results obtained in respect of the two seasons show that under present conditions this is what is actually happening and that the loss of nitrogen is very great.

It is generally believed that ammonium nitrogen when applied is usually absorbed by the clay complex in the first foot of soil. As far as clay soils are concerned, this holds good, but where applications are made on sandy soils, as in the present case, it appears that the ammonium nitrogen moves very readily and leaching takes place as a result of the low clay content of the soils.

There is no doubt, therefore, about the loss of mineral nitrogen owing to penetration beyond the depth of the root zone. In 1942 a comparative study was therefore made of the effect of irrigation plus rainfall and of rainfall alone; the results are given in the following table:—

Loss of mineral nitrogen as a result of irrigation plus rainfall and of rainfall alone. Nitrogen applied in the form of calcium nitrate, 1942 *season.*

Month.	Date of Irrigation.	Rainfall.		Percentage loss of of mineral nitrogen due to		Loss of mineral nitrogen in terms of £ s. d.	
		Inches.	Distribution Days.	Irrigation and rainfall.	Rainfall alone.	Irrigation and rainfall.	Rainfall alone.
						£ s. d.	£ s. d.
July	11th	0·05	1	0·0	0·0	0 0	0 0
August	10th	0·96	3	35·9	0·0	1 9 0	0 0
September	13th	0·21	4	45·0	13·4	1 16 0	16 0
October	17th	3·14	12	55·2	33·0	2 4 0	12 0
November	—	4·34	12	65·0	52·5	2 12 0	1 4 0

Discussion and Conclusions.

The above table shows the percentage loss of mineral nitrogen from July to November, as well as the loss of mineral nitrogen during these months in terms of £ s. d.

If the percentage loss of mineral nitrogen as a result of irrigation plus rainfall is compared, it will be noted that in August, that is, one month after application, the loss is already 35·9 per cent. of the available nitrogen. This loss can only be attributed to leaching, since, immediately after an irrigation ·96 inches of rain were recorded. If the plots that are solely dependent on rainfall are now compared with this, it will be noted that during August there was no apparent loss of nitrogen yet and that it only began to increase after the rainfall.

As regards the area concerned, it is of importance that a fall of 1·17 inches, spread over two months, is sufficient to cause a loss of 13·4 per cent. of nitrogen.

An idea of the loss of mineral nitrogen can be obtained if the percentage loss is worked out in terms of £ s. d. The values, as shown in the table, were calculated in respect of an orchard comprising 100 trees, each of which received a sodium nitrate application of 5 lb. At the current prices of nitrogenous fertilizers, it would have cost the owner 80s. to supply the 100 trees with nitrogen in the form of sodium nitrate.

The table very clearly shows how easily large financial losses can be sustained by leaching due to irrigation plus rainfall on sandy soils. It will be noted from the table that the soil was regularly irrigated until October. The final result shows that at the end of October there was a total loss of 55·2 per cent. of mineral nitrogen as compared with 33 per cent. on the plots that were solely dependent on the fall of rain, and in terms of money this represents a loss of 44s. as compared with 26s. per 100 trees.

The results furthermore show that careful attention should be given to the rainfall, and that irrigation should not be carried out without due consideration. Losses will be sustained as a result of heavy falls of rain, but simple field observations in regard to the tree itself, the amount of rain and its distrubution, and the use of a soil tube should enable the orchardist to obtain the optimum value from his irrigation water and fertilizers.

As regards fertilizers for the area concerned, their efficacy is determined by their form and the times of application. As far as form is concerned, organic fertilizers are preferable. In case inorganic forms are used, they should be applied in small quantities, but more often during the season in order to obtain the best results in the circumstances.

The most suitable time for irrigation will largely depend on weather conditions and the mechanical composition of the soil. Sandy soils should receive most attention and should not be irrigated in the same way as loam and clay soil. Sandy soils should be irrigated more often but with less water at a time. Making the walls of the irrigation basins shallower will considerably reduce the likelihood of applying too much water at a time.

Summary.

1. The research work has been carried out in a citrus orchard in the Rustenburg district.

2. The soil in this orchard is sandy and is representative of the soil of the orchards in the district.

3. Physically, the soil is composed of 49·8 per cent. coarse sand, 29·9 per cent. fine sand and 21·2 per cent. clay.

4. Losses of mineral nitrogen up to 55·2 per cent. may occur as the result of leaching due to irrigation plus rainfall.

5. A fall of rain of 1·17 inches spread over two months is sufficient to cause a loss of 13·4 per cent. of mineral nitrogen in the area.

6. At the present prices of sodium nitrate a loss of 55·2 per cent. of mineral nitrogen due to leaching means a financial loss of 44s. per 100 trees.

7. On sandy soils, such as in the case in point, ammonium nitrogen leaches as easily as in the nitrate form.

8. The only way in which it can be determined when to irrigate without any mineral nitrogen getting lost, is to investigate the moisture condition of the soil.

Acknowledgment.

Our sincere thanks are due to Messrs. Bailey and Cumberlidge who placed their orchard at the disposal of the Department. Thanks are also due to Mr. U. Schmidt of the Division of Chemical Services for his collaboration and assistance.

Early Vegetables in Cold Areas:— [*Continued from page* 496.

on the underside of the glass. This is very important and must be done every morning.

Cuttings can also be rooted in the hotbed. Seeds germinate very quickly and require to be transplanted at an early stage. When they have grown to about one inch in height they should be thinned out or transplanted in tins, each containing about twenty-five plants. From the time the tomatoes start to grow after "pricking out" they must gradually be hardened off by admitting more air into the frame and later transferring them to a cold frame.

This method of raising seedlings in a hotbed should produce tomatoes about four or five weeks earlier. From cold frames they can later be transplanted into larger tins. Plants grown in cold frames at the College produced ripe fruit by the middle of August, but this meant great care in aerating the frames and covering the frames on cold nights with sacks to prevent frost from penetrating. If the leaves of the tomatoes touch the underside of the glass, frost will injure them.

Further particulars may be obtained from the nearest College of Agriculture.

PRICE OF PARATYPHOID VACCINE.

The Director of Veterinary Services notifies for general information that the price of paratyphoid vaccine has now been changed from 2d. per dose to 2d. per single dose and 4d. per double dose. This change has become necessary owing to the more concentrated vaccine now being manufactured.

In ordering paratyphoid vaccine, farmers should note this change in price in order to avoid delay in the despatch of the vaccine.

Nile Grass (*Acroceras macrum*).

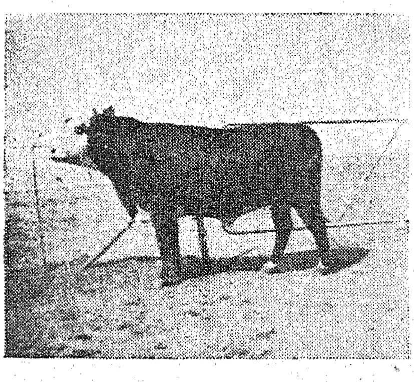
J. P. Botha, Officer in Charge, Athole Pasture Research Station, Ermelo District.

THE grass species *Acroceras macrum*, or Nile grass as most farmers call it, is an indigenous grass from Noorddrift in the Northern Transvaal. This same grass or closely related sub-species are also found in various parts of Africa, within and outside the Union. The grass is found in places as far apart as Berea (Natal) and Eldoret (Kenya). It is also found near Broken Hill (Rhodesia) and Mossamedes and in the marshes of the Kunene River (Angola). In Northern Rhodesia the grass is sometimes called "swamp rye grass". Other *Acroceras* varieties are known in India and in tropical America, while *Acroceras oryzoides*, which is not unknown in the Union, originally comes from Jamaica.

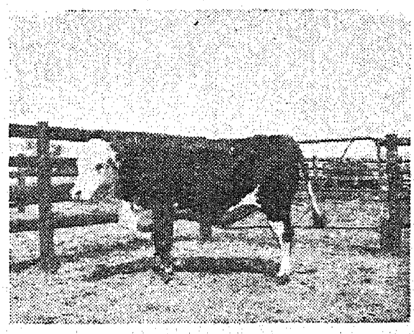
Description.

Acroceras is a summer grass and does not remain green during winter. Some varieties grow upright, while others have a prostrate or running habit. The plant spreads by means of underground shoots appearing on the surface, each time farther from the original plant, or by developing roots at the internodes of the stolons where they come into contact with the ground. Botanically, the various local forms have until now been regarded as the same grass with only the natural habitat as an indication of any possible difference.

Whatever their habit or habitat may be, the various types which have thus far been planted seem to have one important feature in common, viz., their palatability.



Fed on *Acroceras* hay and silage.



Fattened on *Acroceras* hay.

At the Athole Research Station near Ermelo, extensive experiments have been carried out during the past seven years with the variety which comes from Noorddrift, and the results which are discussed here concern this variety only.

The grass was first planted on a small scale at the Rietondale Research Station near Pretoria. About 1935 a number of roots, together with other grasses, were sent to this institution and a small plot in the nursery was planted with the grass. In his report on the nursery work during the year 1935-36, Preller mentioned, amongst others, *Acroceras macrum* as one of the grasses which grew best. The grass adapted itself so well to local conditions that in January, 1938, a whole morgen could be planted, and at present the planting covers an area of seventeen morgen.

Method of Propagation.

Unfortunately, *Acroceras macrum* sets very little seed. The great majority of seed-stalks usually remain without any developed seed. That, however, does not mean that the grass never runs to seed. Seeds do appear and interesting variations of the grass have been obtained at the Prinshof Grass-breeding Station at Pretoria by planting such seed. But seed-setting is so rare that the use of seed cannot be regarded as a practical method of propagation. The only practical method of propagation is with roots.

In the first plantings at this institution, the roots were planted by hand in rows. This method demanded much labour and the cost of planting per morgen was therefore high.

A cheaper and quicker method was tested with success in 1940. After the roots had been taken out of the soil and the soil had been shaken from them, they were sliced with an ordinary cutter, so that the pieces were about 1½ inches long. These pieces were sown on prepared soil, worked in with a disc-harrow and then rolled down. The method was so successful that the first cutting of hay could be reaped within five months after the land had been sown.

Later it appeared, however, that it depended on weather conditions whether the method was successful or not. If dry, warm weather is experienced immediately after the roots have been sown, and especially if the soil is not sufficiently moist, the danger exists that the roots which have not been worked in deep enough by the disc-harrow and are thus near the surface or sometimes partly lie on top of the soil, dry out and die. This causes a feeble and irregular stand.

Better results were obtained when the roots were ploughed in instead of being worked in with the disc-harrow. Here the roots may be sown on the land and then ploughed in, or they may be strewn in the furrow and then covered by the plough.

Both methods have been applied with success, although the latter is more advantageous in practice. With this method it is not necessary to slice the roots, and as the roots in the furrow are closed up almost immediately, there is no unnecessary exposure to the sun which could cause drying out.

An ordinary two-furrow plough may be used. Roots or bundles of roots are placed about eighteen inches apart in the furrow. Four natives, each with a bundle of roots in his arms, are sufficient to keep pace with one plough. It is not necessary to bend down in order to place the roots at exactly equal distances from one another. It is sufficient if they are dropped more or less eighteen inches apart in the furrow. No part of the roots need protrude above the soil. It is advisable to harrow the soil level after the grass has been planted, to facilitate the handling of hay-making implements.

The grass does not sprout soon. Sometimes it takes weeks before the first plants appear above the surface, and after this it may take weeks before all the plants are out. Naturally the period varies considerably according to the depth at which the roots are planted. It is advisable not to plough too deeply, otherwise weaker plants may never reach the surface.

Under local conditions, the first cutting of hay may usually be obtained 5 to 5½ months after the roots have been planted.

Type of Soil.

Acroceras has successfully been cutivated on loamy and sandy loam soils, and in one case on clayey loam soil in the Eastern Transvaal. It is impossible to predict at this stage how the plant will

grow on other types of soil, although possibly the rainfall, more than the type of soil, will be the determining factor.

Rainfall.—*Acroceras* flourishes in areas with a comparatively high rainfall. In the Eastern Transvaal it is cultivated successfully under a rainfall of 30 to 45 inches per year. Probably the grass will not be such a success where the rainfall is much lower than 30 inches.

Time to Plant.

The best time to plant roots is in spring after the first good rains. It is advisable to plant in January or February on old weed-infested lands. At this time of the year the best growing-period for weeds has passed, and the grass has a chance of becoming established without excessive competition from weeds. If, however, it is planted as late as this, no hay can be expected before the next season.

On many weed-infested lands there are usually more weeds and sweet grass visible than *Acroceras* during the first season and sometimes even during the second season, but as a rule the grass already gets the better of the weeds during the second season.

The rate at which the grass establishes itself on such a land naturally largely depends on the planting density of the roots. The nearer the roots are placed to each other in the furrow, the sooner will the grass become established.

About 12 bags of roots per morgen are usually sufficient to ensure a good stand.

A stand of *Acroceras* grass, five months after the roots were ploughed in.

Although it spreads underground, *Acroceras* does not possess the same undesirable tendency as kikuyu, for example, to overrun lands. In the case of a morgen of *Acroceras* planted in 1938 the grass hardly spread two feet beyond the original boundaries of the land, and that only after a period of six years. The grass must be regarded as permanent. It cannot be easily ploughed over, and it is therefore not suitable for a system of rotational cropping.

Fertilizing.

At this institution it was customary to apply 400 lb. phosphate (super rock mixture) per morgen before the grass was planted, and

after that every year another application of 400 lb. of the same mixture. It seems, however, as if better results may be obtained if the initial application is increased to 800 or even 1,200 lb. per morgen when the grass is planted and then not to apply phosphate before the soil is ploughed again.

Acroceras reacts very well to nitrogenous fertilizers such as ammonium sulphate or sodium nitrate, and when these materials are obtainable again it will be profitable to apply up to 400 lb. per morgen annually.

The grass can advantageously be fertilized with compost and kraal manure. This manure must, however, be applied to the soil before the grass is planted. In the case of established grass showing signs of deterioration, it is advisable to strew compost or kraal manure over the soil and then plough it in. This procedure ought not to be necessary more than once in four or five years.

Fertilizing costs at this institution vary from 6s. 8d. to 19s. per ton hay.

During the 1941-42 season the cost of fertilizing a piece of land of five morgen, which had received an application of 400 lb. phosphate and 400 lb. ammonium sulphate per morgen, was only 10s. 3d. per ton hay, ammonium sulphate being reckoned at £15. 17s. 6d. per ton, superphosphate at £5. 7s. 6d. and rock phosphate at £5. 10s. per ton.

During the 1942-43 season the cost on the same land with an application of 400 lb. superphosphate and 500 lb. sodium nitrate per half morgen, was 19s. per ton hay, sodium nitrate being reckoned at £15. 17s. 6d. and superphosphate at £4. 18s. 6d. per ton.

It may be mentioned that the soil on which these results were obtained is extremely deficient in both phosphate and nitrogen. The soil is sandy and shallow with a hard layer of ouklip near the surface.

Hay Yields.

In Progress Report No. 2 (" *Pasture Research in South Africa* "), Preller reports that the yield of *Acroceras macrum* on nursery plots is equal to 16 tons per morgen.

Nursery conditions are, however, difficult to maintain on a large scale and it must also be expected that in practice yields will be much lower than the above figure. The highest yield on a large scale at this institution was 41·9 tons hay from 5 morgen, which is equal to 8·38 tons per morgen, and in another instance 8·5 tons hay was reaped from one morgen.

Yields during the first season are low because the grass is not yet properly established. The highest yields are usually obtained during the second season, after which there is a definite decrease. After 5 years it must be expected that the yields will decrease severely owing to a too dense growth and at this stage it is necessary to plough the land in order to ensure new growth.

The first morgen of *Acroceras* which was planted at this station, gave an average yield during the 6 years of 5 tons hay per morgen.

This figure, however, is only representative of the yield which was reaped as hay. During four out of the six years, only one cutting of hay was taken, while the production for the rest of the season was grazed off, and even when two cuttings were reaped,

the land yielded a considerable amount of after-growth for grazing. The figure of 5 tons per morgen is thus definitely lower than the actual yield.

Palatability and Value of the Hay.

Acroceras is a particularly palatable grass in both the green stage and in the form of hay.

Cattle definitely prefer *Acroceras* hay to the hay of most other grasses, whether natural or planted.

Feed experiments with *Acroceras* hay were carried out at this institution during three successive winters.

The animals used in the experiment were mainly Hereford cross or Hereford grade oxen. At the beginning of the experiment the animals were in god condition.

The oxen were fed in kraals provided with shelters and were allowed to eat as much of the hay as they wanted.

Bone meal and salt were provided in sufficient quantities during the experiment.

The duration of the various experiments, as well as the individual and average increase, are shown in the table.

Results of Feed Experiments with Acroceras *Hay.*

Year.	Date.		No. of days.	Gains of experiment animals.			Average Increase.	Average increase per day.
	From.	To.		1	2	3		
1941	8 May	25 Sept.	140	24	-20	48	17 lb.	0·12 lb.
1942	7 May	3 Sept.	119	220	148	250	206 lb.	1·73 lb.
1943	15 May	11 Sept.	119	215	190	180	195 lb.	1·63 lb.

It is remarkable that the average increase was exceptionally small in the first experiment, and also much lower than that in the subsequent two winters.

In 1941, however, the hay was cut too late. The grass had already passed the hay stage and it was overripe. The result clearly proved the necessity of cutting hay at the right stage.

In 1942 and 1943 use was made of prime hay. The grass was cut at the right stage, i.e. just when it was in full seed. The hay was of a dark green colour and had a good flavour.

Average increases of 206 and 195 lb. respectively in a period of 119 days must be considered very satisfactory, especially if compared with Morrison's figures for lucerne hay.

According to Morrison, lucerne hay indicated increases averaging only 1·20 lb. per day over periods of 100 days in fattening experiments, and when a limited quantity of cereals was also fed, the daily increases were 1·65 lb., i.e. ·45 lb. higher.

Even with cereals as supplementary feed, the daily increase with lucerne hay was thus about the same as for *Acroceras* hay alone during 1942 and 1943.

These figures undeniably prove the high feeding value of *Acroceras* hay. [*Continued on page* 531.

Blackquarter in Cattle and Sheep.

Dr. E. M. Robinson, Veterinary Research Officer, Onderstepoort.

RECENTLY a good deal of correspondence with farmers and farmer's associations on the subjects of various aspects of blackquarter has been dealt with at Onderstepoort. As a result of the questions raised, it seems advisable to clear up a few of the more important points in connection with the disease.

The Causal Organism.

The blackquarter organism belongs to the group of so-called gas gangrene bacteria which includes the malignant oedema bacillus, It is anaerobic, that is, it will only grow in the absence of air. Owing to the fact that it forms spores, it has very great resistance and is therefore difficult to kill. It exists in the soil, particularly in non-cultivated ground.

Animals Affected and Symptoms.

Cattle and sheep appear to be the only species of domesticated animals which develop the disease. Horses and pigs are not susceptible.

In cattle the disease is usually confined to animals between the ages of six months and three years, but in rare cases can occur at other ages. A high fever develops and the animal appears to be very sick. It usually shows very marked lameness in one or both hind legs, but the lesions may occur in the fore limbs with lameness. Occasionally any of the other muscles may be affected, even those of the diaphragm. Often the leg is carried and no weight is put on it. If the muscles of the quarter are felt, there is marked swelling and pain, and gas can be felt under the skin. Sometimes drops of a reddish fluid ooze through the skin. Death usually occurs within one to two days, and recovery is very rare.

In sheep there is usually fairly extensive swelling, mainly on the chest, belly or legs. The swelling is of a bluish red to greenish colour. When cut into, a reddish jelly-like material is found. Usually sheep die within one to three days. When, at a post mortem, one cuts into the swelling in cattle, a reddish fluid runs out and gas bubbles can be seen in the flesh which is reddish black and spongy in appearance with a peculiar smell like rancid butter, which is characteristic of the diseases blackqaurter and malignant oedema.

In sheep the changes in the muscles are not so common and are often absent or very limited.

Methods of Infection.

Experimentally it is only possible to produce blackquarter by inoculating infective material under the skin or into the muscles or other tissues. Sheep are generally infected in this way in outbreaks of the disease, but in cattle one usually cannot find a wound at all. It is thought that in cattle the disease may possibly occur as a result of infection by way of the mouth, or through the skin without lesions developing. These spores remain latent or inactive in the tissues and later develop and produce lesions when stimulated into activity by some as yet unknown factor. In Australia there is a disease in sheep known as "black disease" where the infection is taken in through the mouth and gets into the tissues, and the disease only develops when liver flukes invade the liver and stimulate the bacteria into activity.

Occurrence.

The blackquarter organism has a very wide distribution in the soil of most countries, but is commonest in uncultivated soil, so that the disease more often occurs under ranching conditions. It is probable that the infection exists on all farms, but it is heavier on some than on others. The chances of spreading infection are increased by neglecting to bury or burn diseased carcases on which post-mortem examinations are carried out. It has been observed that blackquarter, as a result of shearing wounds in sheep, may occur on farms where the disease has not been seen in cattle. As these farms usually have very few cattle on them, one cannot say that they were free from infection. It is, however, quite possible that the infection in some of the outbreaks which occur after shearing, has been brought on to the farms with shearing implements or by natives carrying infected meat about from one farm to another. In any case, to quarantine farms where blackquarter has occurred would serve no useful purpose and would very likely lead to concealment of the disease. Enforcement of the quarantine would require a very big staff as well.

Immunity and Control Measures.

Calves under six months appear to have a certain degree of resistance to the disease, and cattle over three years rarely die of blackquarter. It has been observed that animals in good condition are more susceptible than those whose condition is poor.

Ordinarily, the only satisfactory method of preventing the disease is to inoculate animals with an efficient vaccine. The best vaccines at the present time consist of killed cultures of the organism, with the addition of alum which causes the vaccine to be absorbed slowly and so produce a more lasting immunity. It has been claimed for certain vaccines that they will produce a life-long immunity with one inoculation. On testing these vaccines, however, it has not been found that the immunity after a year is still satisfactory. To prevent blackquarter, an annual inoculation should be carried out on all animals between six months and three three years old. Contrary to statements in advertisements of certain imported vaccines, calves under six months do not immunize very well and, if they are inoculated, they should be re-inoculated before they are a year old.

In the case of blackquarter in sheep, due to infection of shearing wounds or after castration or docking, the best preventive measure is undoubtedly to inoculate the sheep at least 14 days before shearing commences. In addition, the sheep should not be shorn in infected premises and it may be necessary to do this work on a bucksail in the open. Disinfection of an infected shed is very difficult, and is only possible where there is a wooden or concrete floor. Sterilization of the shearing instruments, preferably by boiling for at least 15 minutes, is a very important measure. The clothes of the shearers should be boiled for an hour and it may be advisable to keep special sterilized clothes for them. If sheep die, the carcases should not be given to natives as the disease may be distributed with the meat.

Finally, it should be mentioned that outbreaks of blackquarter in cattle and sheep have occurred as a sequel to inoculation with any type of vaccine, as for anthrax, blackquarter, blue tongue, etc. The infection is not in the vaccine, but results from contamination occurring during inoculation. All the pamphlets issued with

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The Draught Horse.

V. Positions of the Limbs and Feet.

Dr. L. L. Roux, Senior Professional Officer, and H. J. van der Merwe, Lecturer in Animal Husbandry, Grootfontein College of Agriculture, Middelburg, Cape.

IN view of the importance of sound limbs and good feet in horses, considerable attention is given to this question, and the following information, contributed by Dr. J. Quinlan, Assistant Director of Veterinary Services, will be of great interest.

The limbs and feet of a horse should be examined from the sides, back and front, the person making the examination standing some distance from the animal.

Normal Positions.

When a horse is standing on even ground with the weight distributed in a physiological manner, the normal position of the limbs and feet is as follows:—

The fore-limbs should be situated vertically under the shoulder in such a way that a plumb-line dropped from the centre of the point of the shoulder should divide the limb and foot evenly. (See Fig. 1.) The distance between the fore-limbs should be moderately wide; wider in the heavy than in the light breeds. Great width between the limbs is most undesirable. From the side a line dropped from the centre of the shoulder blade should divide the limb from the elbow to the fetlock and pass just behind the bulbs of the heels. Similarly, when the horse is viewed from behind, a line dropped from the point of the elbow should divide the limb and pass through the hollow between the bulbs of the heel.

Viewed from the side, the hind-limbs are normal when a line dropped from the hip joint divides the foot at the middle (see Fig. 2). When the animal is viewed from behind, a line from the buttocks to the ground should divide the limb and foot, falling between the bulbs of the heel. The distance between the hind-limbs should also be moderate; too close or too wide formation is undesirable.

If a horse's limbs approximate the description given as normal, his movements will be correct, that is, in lines parellel to the long axis of the animal's body.

The toe axis is an imaginary line through the centre of the phalanx, that is, through the pastern, coronary, and pedal bones (Fig. 3). When viewed from the front, the toe axis should be parallel to the long axis of the body; this applies to both fore- and hind-feet. Seen from the side, it should pass straight through the bones from the fetlock to the ground at an angle of about 50 degrees in the fore-limbs and 55 degrees in the hind-limbs.

Abnormal Positions of the Limbs.

The fore-limbs are abnormal if they are—

(*a*) extended in an *outward* direction, so that the distance between the feet is greater than that between the fore-arms (Figs. 4 and 5);

(*b*) extended in an *inward* direction, so that the distance between the feet is narrower than that between the fore-arms;

(*c*) knock-kneed, i.e., if the knees are too close together;

(*d*) knee-wide or bandy-legged, i.e., if the knees are too far apart or the legs are O shaped;

(*e*) standing-over, i.e., if the limbs are placed too far forward;

(*f*) standing-under, i.e., if the limbs are placed too far back;

(*g*) standing-over at the knees, i.e., if an angle is formed at the back of the knee, with the leg not vertical and the knee projecting forward;

(*h*) calf-kneed, i.e., if there is a concavity in front of the knee,

forming an angle between the fore-arm and the cannon.

The hind-limbs are abnormal if (as in Fig. 6), they are—

(*a*) ground-wide, as in the case of fore-limbs;

(*b*) ground-narrow, as in the case of fore-limbs;

(*c*) cow-hocked, i.e., if the hocks are too close together;

(*d*) turned-out or bandy-hocked, i.e., too far apart at the hocks;

(*e*) standing-back, i.e., if the hind-limbs are too far back (Fig. 7).

(*f*) standing-under, i.e., if the hind-limbs are placed too far under the body;

(*g*) sickle-hocked, i.e., if the angle between the leg and the cannon is too narrow;

(*h*) straight-hocked, i.e., if the angle between the leg and the cannon is too wide.

Abnormal Position of the Feet.

The feet of horses are abnormal when (see Fig. 4) they are—

(*a*) pigeon-toed, i.e., when the toe axes are turned inward;

(*b*) lady-toed, i.e., when the toe axis are turned outwards;

(*c*) flat-footed, i.e., when the angle formed by the toe axis with the ground is less than 50 and 55 degrees;

(*d*) boxy-footed, i.e., when the angle formed by the toe axis with the ground is greater than 50 and 55 degrees;

(*e*) bear-footed, i.e., when the foot is the boxy type, but the pastern slopes abnormally.

The shape and size of the foot (Fig. 8) are governed by the work the foot is called upon to do. The fore-foot bears the weight and, consequently, is rounded. The hind-foot helps to act as the point from which the body is propelled and, since it requires a firmer hold on the ground, is consequently more pointed. In regard to the question of the weight borne by the feet, it must be pointed out that the fore-feet bear 60 per cent. of the weight of the body, while the hind-feet bear 40 per cent.

The position of the limbs also influences the shape of the feet. If the feet are properly cared for, a normal limb will have a proportionate foot, while an abnormal position of the limb will develop a foot which deviates from the normal proportionate foot, that is, it will develop a foot which suits the shape of the limb.

The proportionate foot has already been described. The types of feet found in the abnormal positions of the limbs will now be described.

The Feet of Incorrectly Placed Limbs.

(1) *The ground-wide position.*—The inner side of the wall is short and straight. There is a tendency for the outer wall to be long and sloping.

(2) *The ground-narrow position.*—This is the opposite of the foot of the ground-wide position. The outside wall is straighter and shorter than the inner wall.

(3) *Lady-toed position.*—This foot is somewhat similar to the foot of the ground-wide position.

(4) *The pigeon-toed position.*—This foot is somewhat similar to the foot of the ground-narrow position.

(5) *The standing-over position.*—This type of foot has an abnormally long toe and low heel. The posterior part of this foot carries most of the weight.

(6) *The standing-under position.*—This type of foot tends to be "boxy". The toe is erect and the heels high. The greatest weight is carried by the anterior part of the foot.

The position of the limbs and feet modifies the action of the horse. Consequently, it is necessary to observe the position of the limbs, as well as the horse in action, before shoeing. In normal

action the feet and limbs are moved in a straight line. The heels come to the ground first. The bearing surfaces of the quarters on the inner and outer sides come to the ground at the same moment.

In the ground-wide and lady-toed animal there is an inward and then an outward curve of the foot while it is being moved forward (Fig. 9). The outer part of the wall comes to the ground first.

In the ground-narrow animal and the pigeon-toed animal the movement is just the opposite. There is an outward curve and then an inward curve before the foot comes to the ground. The inner aspect of the wall comes to the ground first. The swing off—as the foot leaves the ground—is from the inner aspect of the toe in the ground-wide position, while in the ground-narrow position it is from the outer aspect of the toe.

In the young animal it is possible to correct almost any abnormal position of the foot by correct shoeing, provided, of course, that a careful study is made of the limb and foot. In older animals complete correction is not always possible, but considerable improvement can be effected by careful shoeing.

In treating malformations of the limbs and feet great care and patience must be exercised, as rapid transformation of the foot in shoeing may produce lameness and partial dislocation of the joints.

Stud Services for Selected Mares, 1944-45.

STUD services for selected farmers' mares (donkey mares at Potchefstroom only) will again be available at the following colleges and stations.

Stud Station.	*Scheme A.*	*Scheme B.*
1. Grootfontein College, Middelburg, C.P.	Lakanal, O'Laet	Lancier, Offenbach.
2. Glen College, Glen, O.F.S.	Grootfontein Bayard	Reuben Amos; and the Thoroughbred, Boblo.
3. Elsenburg College, Stellenbosch, C.P.	Grootfontein Monsieur	Grootfontein Karel.
4. Cedara College, Cedara, Natal	C. Peter	C. Estane.
5. Potchefstroom College, Potchefstroom, Tvl.	Grootfontein Just; and the Donkey Jacks, Joe Louis and P. Knight	Glen Jan; and the Thoroughbred, Fast Castle. P. Tjaka (Jack).
6. Ermelo Research Station, Ermelo, Tvl.	—	Grootfontein Champion; and the Thoroughbreds, Kenilworth III and Vlakfontein.
7. Dohne Station, P.O. Dohne	Glen Jix	—
8. Pretoria University, Pretoria	Grootfontein Pontius	—
9. Oakdale School of Agriculture, P.O. Riversdale	Grootfontein Jasmine	—

Conditions of service are obtainable from the stud nearest to the applicant. In view of the experience of the past two seasons, farmers are requested to apply early, i.e. not later than 31 August (31 July for the Grootfontein College area), because applications exceed the existing accommodation at all the stud stations, and bookings cannot otherwise be properly regulated.

Subject to other conditions, mares will not be received after 25 December. Only mares of good type, 14·2 hands and over, in good condition and fully halter-tame, will be accepted. Mares not conforming to these requirements may be returned after inspection.

The season opens on 1 October 1944 and closes on 15 February 1945.

Oatmeal In Laying Rations.

P. J. Serfontein, Professional Officer (Poultry Research),
College of Agriculture, Potchefstroom.

IN the past, oats constituted only a small percentage of the total ingredients of poultry rations, the principal reason being the lower price of maize and wheaten by-products in comparison with that of oats. In spite of the price of oats, however, the use of this cereal has shown a considerable increase after the publication of certain results which indicated that oat husks possess qualities which prevent cannibalism. In England, however, poultry farmers have for many years made extensive use of oats in the form of Sussex ground oats—a term which has now gained international currency. The value of this product in fattening rations is strongly emphasized.

Before the new regulations governing the grinding of wheat became operative, wheaten pollard and wheaten bran constituted a substantial proportion of our poultry rations. Since then, however, wheaten pollard has completely disappeared from the market, while wheaten bran is available in limited quantities only. As a result of this position and the considerable increase in the prices of certain feed constituents, large quantities of oatmeal have been used to supplement the shortage of the products mentioned. The greater use of oatmeal in poultry rations during the past two or three years is therefore mainly due to the need for supplementing the shortage of wheaten by-products and not to the superior qualities of certain nutrients which oatmeal may contain. It is essential, therefore, to know the extent to which oatmeal can meet this need. Consequently experiments were carried out at this Institution with a view to determining the effect of the increased use of oatmeal on the production and health of fowls.

The oat product used in these experiments was oatmeal. For general information it is interesting to indicate the difference between oatmeal and Sussex ground oats—a difference which often leads to considerable confusion. Oatmeal, or rather unsifted oatmeal, is obtained by grinding the grains along with their husks. The degree of fineness varies considerably, as does the quality which is determined by the bushel weight of the grains. The husk remains visible in the product. The term Sussex ground oats does not denote any specific species or variety of oats but mainly a product in which the husk has been ground so fine that it can no longer be distinguished with the naked eye. The name originated in Sussex, England, where the product was regarded as indispensable in the fattening of fowls. Special grinding stones are used for milling the oats. In order to facilitate the grinding process, oats and barley are mixed in the ratio of one to eight since barley is so much drier; any kind of oats, irrespective of the country of origin, is used, price being the only factor taken into account.

There is, as might be expected, a difference between the composition of wheaten by-products and that of oatmeal. The extent to which these products can replace one another, will depend on their composition—a factor which also enables the superiority of one over the other to be determined. The composition is as given in Table I:—

Five groups of White Leghorns were made up, each consisting of 60 pullets which had just come into production, and five cockerels. These birds were housed intensively in houses measuring 18 ft. by 20 ft. Trap nests were provided. All pullets which died were immediately examined in order to ascertain the cause of death.

TABLE I.—*Average composition of oatmeal, wheaten bran and wheaten pollard.*

Constituents.	Oatmeal.	Bran.	Pollard.
	%	%	%
Total digestible nutrients........	62·0	41·0	48·0
Crude proteins..................	11·2	15·6	17·0
Digestible proteins.............	74·0	66·0	65·0
Crude fibre.....................	11·3	9·0	5·1
Total digestible crude fibre......	12·0	9·0	8·0
Calcium........................	0·10	0·11	0·07
Phosphorus.....................	0·36	1·21	0·69
Manganese..................	34 p.p.m.	119 p.p.m.	113 p.p.m.
Vitamin A (international units per lb.).................	80	150	100
Vitamin B (international units per lb.).................	1200	840	800
Riboflavin..................	400 gammas	750 gammas	600 gammas
Choline chlorate per gram......	1·00	1·56	1·63

The experiment was commenced on 1 April 1943 and continued until January 1944. The rations fed are given in Table II.

TABLE II.—*Constituents of rations.*

Constituents.	Group 1.	Group 2.	Group 3.	Group 4.	Group 5.
	lb.	lb.	lb.	lb.	lb.
Yellow maize meal...........	24¼	23½	22¾	22	12½
Oatmeal....................	—	10	20	25	30
Wheaten bran...............	30	20	10	5	—
Conc. fishmeal and meat meal.	21	21½	22¾	22½	23
Groundnut oilcake meal 100: 109 : 144..................	—	—	—	—	—
Lucerne meal................	10	10	10	10	10
Molasses...................	3	3	3	3	3
Bonemeal..................	7	7½	8	8½	8¾
Oystershell powder..........	4¼	4	3¾	3½	3¼
Salt.......................	½	½	½	½	½
Manganese..................	½ oz.	½ oz.	½oz.	½ oz.	½ oz.
Yellow maize (grain).........	100	100	100	100	100
	100	100	100	100	100

TABLE III.—*Constituents of equal parts of mixture and grain according to calculation.*

Constituents.	Group 1.	Group 2.	Group 3.	Group 4.	Group 5.
Crude fibre..................	3·97	4·05	4·14	4·18	4·22
Crude protein................	15·58	15·53	15·47	15·52	15·51
Calcium.....................	2·00	2·01	2·03	2·00	2·04
Phosphorus..................	0·93	0·93	0·91	0·99	0·98

The grain feed consisted of crushed yellow maize which was fed at noon according to measure. The mixtures as given in Table II were fed in open hoppers which were always accessible. Coarse oystershell was also provided in open hoppers. In view of the limited supply of grain constituents, the protein additions were derived from three sources. Consequently, greater variety could be introduced. Green feed was given once a day at noon and consisted of lucerne, wheat or oats, depending on the time of the year.

Every pullet was weighed at two-monthly intervals. Any cases of abnormality such as feather-eating and prolapse were recorded.

Owing to circumstances which prevailed at the time, a large percentage of the hens were already in production when they were transferred from free-range to the permanent houses. The result was that many of the birds went into a moult and that production during the first two months was low.

TABLE IV.—*Average body weight.*

Month.	Average Weight of Pullets.				
	1.	2.	3.	4.	5.
1943—					
April	3·82	3·90	3·74	3·64	3·67
June 1	4·19	4·52	4·46	4·11	4·35
August 1	4·27	4·74	4·55	4·21	4·65
October 1	4·12	4·72	4·17	3·80	4·42
December 1	4·15	4·48	4·10	3·74	4·28
January 31 (1944)	4·16	4·63	4·08	3·80	4·35

TABLE V.—*Average egg production of pullets surviving at the conclusion of the experiment and the weight of eggs.*

	No. of Eggs.	Average Weight per 100 Eggs.
Group 1	132·9	6,333 gram.
Group 2	149·9	6,166 ,,
Group 3	150·0	6,230 ,,
Group 4	115·3	6.160 ,,
Group 5	150·5	6,151 ,,

TABLE VI.—*Average feed consumption for ten months of pullets in production at conclusion of experiment.*

Group.	Mash.	Grain.	Total.
1	35·75	42·83	78·58
2	47·13	39·46	86·59
3	37·77	40·19	77·96
4	35·01	38·49	73·50
5	47·12	39·64	86·76

TABLE VII.—*Feed consumption per doz. eggs produced.*

Groups.	Consumption.
	lb.
1	7·09
2	6·94
3	6·23
4	7·64
5	6·91

TABLE VIII.—*Percentage hatchability.*

	Rations.				
	1.	2.	3.	4.	5.
No. of eggs placed in incubator.	334	428	423	308	373
Percentage eggs infertile......	3·59	7·24	9·21	9·09	8·04
Percentage dead embryos.....	9·00	8·56	4·68	7·14	11·37
Percentage dead in shell......	27·01	26·70	17·44	24·64	24·11
Percentage chicks from fertile eggs.....................	63·97	64·73	77·86	68·19	54·51

TABLE IX.—*Percentage mortality (deaths from cancer excluded).*

Groups.	Percentage.
1......................	13·33
2......................	11·66
3......................	13·33
4......................	11·66
5......................	18·33

Discussion of Results.

The average production of the pullets still alive at the conclusion of the experiment is given in Table V. The much lower production of group 4 is ascribed to an inexplicable outbreak of visceral gout in this group during May. At this stage the pullets had just come into production again after having been in the moult as a result of the removal mentioned above. A few pullets in this group died. In the other groups no cases occurred. Molasses was fed in the drinking water of all groups. Despite the fact that the pullets in Group 4 recovered, they were nevertheless out of production for a considerable time, and, as will be seen from Table IV, which gives the weights, the setback is reflected throughout the period during which the experiment was in progress.

Up to 30 per cent. the percentage of oatmeal apparently did not cause such a marked difference in egg production between the groups as did the substitution of oatmeal for a portion of the wheaten bran. In those cases where oatmeal was included in the ration, production was quite satisfactory if it is borne in mind that, although the experiment extended over a period of 10 months, the pullets were in the moult for at least 1½ months of this period.

A noteworthy feature in the various groups is the amount of feather-eating which occurred as compared with the latest results published in this connection. The results referred to appeared to indicate that oat husks possess a property which prevents feather-eating. In the experiment under discussion, however, feather-eating increased in severity in the various groups as the percentage of oats in the mixture was increased. At the conclusion of the experiment the pullets in Group 5 which were fed on a ration containing 30 per cent. oatmeal were entirely denuded of feathers over the abdomen and breast; the feathers were also badly plucked around the neck and during the last month of the experiment the birds began to peck at one another in the region of the tail. This vice occurred to a lesser extent in Groups 2, 3 and 4, and was practically absent in Group 1 where the mixture contained 30 per cent. wheaten bran. In this experiment oatmeal definitely did not prevent feather-eating.

In group 5, the only one in which cannibalism in the form of vent-pecking occurred, this vice resulted in the death of 5 pullets. The cause of this was definitely the fibre present in the oatmeal. Several pullets in the group were saved. In the cloaca the excrement forms a large fibrous ball in which the oat husks are clearly discernible. As a result of the efforts of the pullet to rid herself of this ball, and the continuous pressure exerted in the process, the vent is extruded. She then begins to peck at this organ herself and before long is followed by the whole flock. The only explanation for this condition appears to be that the fluid secretions of the kidneys and the solid excreta of the digestive tract are thrown together in the cloaca where the high fibre content of the excrement tends to absorb the liquid and so forms a large hard mass. It therefore does not appear advisable to add as much as 30 per cent. oatmeal to laying rations.

The egg weights which were taken once a month for five consecutive days, are given in Table V. The differences are extremely small. Practically no cases of soft-shelled, cracked or broken eggs occurred in any of the groups.

As for the hatching results which are given in Table VIII, the only conclusion that can be drawn is that they are very confusing. Possibly the numbers of eggs placed in the incubator were too small. It is doubtful whether an increase of 5 per cent. in the oatmeal could have resulted in as great a difference as 13·68 per cent. between groups 4 and 5.

The percentage of mortality given in Table IX is not abnormally high if the cases of cancer are excluded, except in Group 5. As has been mentioned above, 5 pullets in this group died of cannibalism. The cases of death from causes other than cancer varied considerably, and in no group did any particular symptom occur which was predominant enough to allow of any connection between it and the feed being established. Apart from the cases of cannibalism which occurred, all the rations should be regarded as normal in this respect.

The state of health of a pullet is largely reflected by her weight. Table IV shows that the increase in weight was good in all groups and, what is even more satisfactory, that (except in Group 4) the average weight was high, even at the conclusion of the experiment. After the outbreak of visceral gout the pullets in this group never recovered completely.

Conclusions.

The following conclusions can be drawn:—

(1) Now that the supply of wheaten bran is limited and wheaten pollard unobtainable, oatmeal has become an important constituent of laying rations. Oatmeal is definitely of great value as a feed for supplementing wheaten bran. As soon as the two products were fed together, egg production increased.

(2) Oatmeal apparently has a more beneficial effect on egg production than wheaten bran. Even in those groups where wheaten bran was fed in limited quantities or even omitted altogether production was high. Where wheaten bran alone was fed together with other products, production was poor.

(3) Under the prevailing circumstances it would be advisable to vary the percentages of wheaten bran and oatmeal used in rations for

egg production from 10 to 20 per cent. in each case according to the availability of the product. The ideal figure would probably be 15 per cent. of each.

(4) It is advisable that the oat husks which occur in the oatmeal should be ground as finely as possible.

(5) In this experiment the feeding of oatmeal definitely did not prevent feather-eating. These results correspond with those obtained in previous experiments where feather-eating occurred in spite of the inclusion of oat husks. In these circumstances the inclusion of wheaten bran appears to have played a greater part than oatmeal in the prevention of feather-eating.

Consult Your Extension Officer.

ARTICLES and talks on agricultural subjects, especially those in which information or action is needed, almost invariably close with the appeal: " Consult your extension officer ".

Within 20 years the agricultural extension officer has risen from an almost unknown factor in rural affairs to a place of considerable importance. Originally regarded as theorists and impractical, extension and home economics officers have come to be the trusted counsellors and guides of more than half a million members of the farming community. They have risen to this position not because they have something to sell or a theory to teach, but because they have been of practical assistance to farmers and their wives by helping them to increase their incomes and to improve their farming and domestic operations.

Extension officers have grown strong because they carry honest, unbiased and, as far as they know, accurate information to those they serve; because they bring sympathy and hope and point the better way; and because they help rural people to develop themselves through collective counselling, through the analysis of local, district, provincial and national problems, and through co-operation with the Government. They have grown strong because, in carrying on their work, they help rural people to see more widely, think more deeply, and act in the light of facts which farmers themselves help gather and help interpret. Extension officers encourage the open mind. That is perhaps their greatest achievement.

The man who looked askance at extension officers 19 years ago, to-day seldom takes any important step affecting either his farming operations or his home, without consulting his extension officer. The extension officer or the home economics officer is now recognised as a reliable source of information on local problems.

May the advice " Consult your extension officer " continue to be followed by an ever-increasing number of the farming community.

(J. D. de Wet, Senior Extension Officer, Pretoria.)

A Popular Bulletin for the Farmer.

Bulletin 234.—" Re-inforced Circular Reservoirs ", obtainable **from the Editor, Department of Agriculture and Forestry, Pretoria, at 3d. per copy.**

Blood Smears and Vaccines: Reasons for Delay.

FROM time to time farmers complain that they sometimes receive no reply to letters addressed to Onderstepoort and that cases even occur when either they are not informed at all as to the results of investigations of blood smears and samples, or else receive this information after some delay. The reasons for possible delay are the following:—

Owing to abnormal war conditions much of the work has to be done by temporary officers who have generally not had much experience in this particular line, so that in the circumstances mistakes are almost inevitable, and farmers sometimes have grounds for complaint. In fact, it is surprising that so few mistakes are made, especially if the enormous expansion of the services which Onderstepoort renders to farmers is borne in mind. Every month this Institution handles about 13,000 letters, 11,000 orders for vaccines and other products, and about 19,000 samples and bloodsmears. Yet it has been found that most complaints do not arise from mistakes made by officers but from one or other of the following:

(1) Samples, smears and sometimes even letters are forwarded without the writer's name and address, or else the address given is incomplete. Numerous such samples and smears are received and the Institution simply cannot deal with the matter. Quite recently anthrax was diagnosed in a smear, but as the owner had failed to supply his address he could not be advised as to the position.

Sometimes a farmer wires from a temporary address when he happens to pass through a town. This Institution then directs its correspondence to that address to which it also forwards the vaccine. In due course both correspondence and vaccine are returned, marked "Unknown", by the post office. In telegrams the initials of the owner and the name of the farm should be given, otherwise confusion might arise.

It is important to know that any farmer who writes to us in connection with samples and blood smears is registered under the name of his farm and district. On moving from his farm and again writing to this Institution he sometimes finds to his surprise that the officers do not know everything about him.

(3) Samples are sometimes forwarded in an unsatisfactory manner. A bulletin containing full particulars as to the manner in which a smear should be forwarded, is supplied free of charge. Much confusion is caused by forwarding samples without supplying particulars simultaneously and not posting a letter until a few days later when putrefaction may already have set in. If favoured by fortune the officers concerned may succeed in co-ordinating the letter and sample in good time, but in most cases they will have to resort to detective methods. In making up the package, it is always advisable, whenever possible, to include full particulars of the samples and the circumstances in which the deaths occurred, so as to expedite the whole investigaation.

(4) Sometimes a farmer writes to the Institution about vaccine or some other matter. If he receives no early reply, he often wires without referring to his letter, with the result that double consignments of vaccines are often forwarded to him, involving much unnecessary work and financial loss to the owner or the Department.

(5) In order to assist farmers as much as possible, orders are once more accepted over the telephone, but if vaccines which keep for a

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Winter Cereal Grazing for Milk Production.

H. P. D. van Wyk and W. A. Verbeek, Vaalhartz Experiment Station.

DURING the winter months it is difficult to supply the required amount of quality feed to cows without causing a rise in the costs of production, since the digestible nutritive constituents of natural grazing are low during that period. Apart from the high prices, there is also a grave shortage of protein-containing concentrate feeds, and it is essential, therefore, that fodder crops which can be grown by the farmer himself and which can wholly or partially replace concentrate feeds, be used as effectively as possible. In the selection of feeds which can be grown for this purpose, consideration should be given to the high feed requirements of high-producing dairy cows.

Since young winter cereals have a high nutritive value and digestibility, this crop, where it can be successfully grown, should play a very important rôle in the feeding of dairy cows. Winter cereals, such as oats and wheat, have a high and satisfactory protein content and they are also well provided with the necessary mineral constituents. As a result of these properties, together with palatability and a low fibre content, young winter cereals compare favourably with a well-balanced concentrate mixture, and it is essential, therefore, to utilize this valuable pasture crop as economically as possible.

At the Vaalhartz Experiment Station experiments have been conducted in connection with winter cereal grazing for milk production and useful data were thus obtained, such as:—

A cereal pasture crop can be used as the sole feed or as a supplementary feed; if used as the sole feed, it provides sufficient nutrients for maintenance and for the production of 3 to 4 gallons of milk a day. It has been found, however, that the exclusive grazing of young cereal crops has a very laxative action on cows, but this can be prevented by rationing a small quantity of dry hay. Where the amount of grazing is limited and the production capacity of the cows is less than 3 to 4 gallons, it could be more profitably used as a supplementary feed. Experimental work was carried out with cows which grazed oats for one and three hours respectively and in addition received 20 lb. of lucerne hay per cow per day. The results showed that in the case of one hour's grazing on oats, plus 20 lb. lucerne hay, an average production of 2½ gallons milk could be maintained, while in the case of three hours' grazing, plus 20 lb. lucerne hay, an average production of 3 gallons of milk could be maintained. In a similar experiment with wheat grazing, cows were kept on pasture land for one hour per day, with 20 lb. lucerne hay as a supplementary feed in the one case and as much as they wanted to eat in the other. The results also revealed that a production of 2½ gallons of milk could be obtained in the former circumstances and 4 gallons in the latter.

The advantages presented by the system of a limited grazing period per day are, furthermore, revealed by the following carrying capacity figures:—(1) Oats grazed for the full length of time, yielded on an average 140 cow grazing days per morgen, and (2) oats grazed one hour and three hours per day respectively, yielded an average of 332 cow grazing days per morgen.

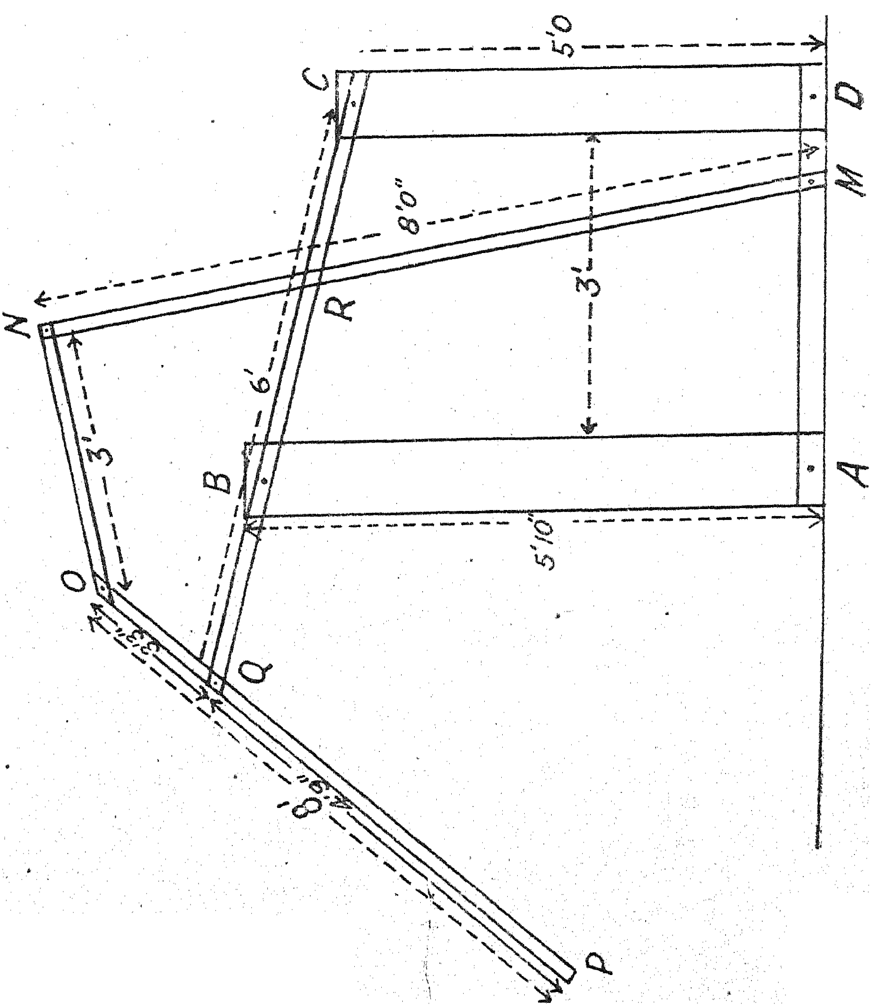
[Continued on page 531.

A Handy Crush for Cattle.

J. J. S. Celliers, Extension Officer, Kokstad.

THE advantages of the ordinary crush on the cattle farm are known to all practical cattle farmers. Sometimes, however, an animal has to be treated in a special manner as when it has to be dehorned, dosed, tattooed, or, in the case of bulls, under the Cattle Improvement Act, brandmarked. In all these cases the animal has to stand perfectly still, else the operation cannot be successfully performed.

Mr. H. M. S. Bastard of the farm Willowmore, P.O. Kokstad, has on his farm a very handy and simple crush which eliminates



such laborious work as the casting of the animal or the fastening of it in the crush.

This contrivance is attached to the end of an ordinary crush and is manipulated by a single person. If the head of an animal is caught in its grip, such animal stands motionless and almost any operation can be performed on it without the use of a riem.

The contrivance is explained in the accompanying figure. AB and CD are two perpendicular posts at the end of the crush which must be exceptionally strong to serve their purpose. Their above-ground measurements are respectively 5 ft. 10 in. and 5 ft. 0 in. On both sides of AB and CD two laterals measuring 3 in. by 4 in. are attached by bolts just above the ground. At a point M the vertical MN, measuring 3 in. by 4 in., is attached to these laterals by a bolt at such a distance that the inner measurements between MN and CD at ground level is 6 in.; on both sides of the top ends of AB and CD two laterals measuring 3 in. by 4 in. are attached by bolts; between these laterals MN can freely move at R. The lever OP is bolted at Q. The lenghts of PO, ON, NM and QC are as shown in the figure; the thickness of PO and ON usually is 3 in. by 1½ in.

The neck of the animal is caught between MN and CD by an upward movement of the lever; if the lever is pressed downward it is released and the animal can move.

Blackquarter in Cattle and Sheep :— [Continued from page 508.

vaccines from Onderstepoort describe the best methods of inoculation in order to avoid such infection. The main point is not to rely on disinfectants, but to sterilize the syringe and needles by boiling them for at least fifteen minutes and to use a separate needle for each animal. Disinfectants are rarely used in sufficient strength to kill bacteria, and the disinfectant may thus become infected and be a source of danger.

[Continued from page 519.

Black Smears and Vaccines: Reasons for Delay :—

limited period only have to be consigned by road motor service, orders will not be executed since it has been found that deliveries in such cases are seldom effected in good time.

(6) If farmers will forward the money when placing their orders, the work will be greatly facilitated for all and they will receive the vaccine much earlier. They should keep the price list of Onderstepoort in a place where it can easly be consulted as they will then know what amount of money to forward. The price list can be obtained free of charge from Onderstepoort.

Since the matter is of such importance the main points to be remembered are recapitulated.

(1) The name and full address should be clearly stated. The name and address should be distinctly painted on the empty blowfly vaccine cans, else very serious confusion and disappointment will be experienced. Farmers are requested not to drive any nails into the cans since the holes render such containers useless for further service.

(2) Initials should be stated in telegrams since hundreds of the inhabitants of a town may bear the same family name, e.g. Van der Merwe.

(3) If farmers forward samples, they should follow the instructions, which are given by this Division free of charge.

(4) Money should accompany the orders at the rates quoted in the price list, which must be kept in a place where it can be readily consulted.

(Division of Veterinary Services, Onderstepoort.)

Iodometer Dip Tester.

New Abridged and Improved Directions for Determining the Strength of Cattle Dips, 1944.

The following instructions are intended to cancel all previous instructions in this connection and should be carefully read:—

THE Division of Veterinary Services, P. O. Onderstepoort, offers for sale at 12s. 3d., postage free within the Union, an apparatus for determining the strength of all cattle dips intended for the destruction of ticks and which consequently contain arsenic in the form of sodium arsenite as active principle. The apparatus is inexpensive and has this advantage over other testers that the strengh of a dip can be determined by means of it even if part of the arsenite has become oxidized, i.e. changed from arsenite to arsenate, in which latter form the testing fluid no longer has any effect on it.

The apparatus—which is also known as the laboratory dip tester—consists of the following parts, which are obtainable separately. Prices may vary from time to time, however, and application for a price-list should therefore be made.

1. *The dip tester itself* consists of three celluloid tubes in a round, wooden box and costs 8s. (or 2s. 8d. per tube). The smallest tube, known as an " Iodometer ", is graduated downwards to 25 c.c. in graduations of ½ c.c. and is used to determine the quantity of testing fluid used for titration purposes. The medium tube is marked only at 25 c.c. and is used for measuring off the sample of the dip that has to be tested after it has been cleaned in the large tube.

2. *The testing fluid* (iodine solution of a definite strength) is supplied in a small flat bottle holding 7 fluid ounces or 200 c.c. and packed in a wooden box. The bottle has a tight-fitting ground glass stopper. *On no account must any but glass stoppers be used* as iodine attacks everything else and thus loses its strength. The price is 2s. 9d., but if the bottle is returned undamaged with stopper and box, it will be refilled at the small cost of 6d.

3. *The reaction tablets* are of three colours, viz. red, white and blue, and are supplied in cardboard tubes of the same colours, each tube containing 20 tablets and the price being 6d. per tube. The red (acid) tablets are used to clean the sample of dip; the blue or reducing tablets to convert the oxidized portion of the dip to its original form in which it can be tested; and the white or alkaline tablets serve to neutralize the acid (from the red tablets) before the testing fluid is added to determine the arsenic content.

How to Use the Apparatus.

The test consists of first cleaning a sample of the well-stirred dip from the dipping tank and testing it both for arsenite and arsenate (the oxidized part), after which the quantities of dip or water to be added can be calculated.

The Test.

1. *Stir the dip* in the tank thoroughly by means of a bucket attached to a riem, or better still, by dipping some animals.

2. *Take a sample* of the dip in a bottle having a capacity of at least 100 c.c. (i.e. the size of the largest celluloid tube). The sample should not be taken with the tube. The test should be made immediately after the sample has been taken, as certain changes may take place in it. If the dip is not tested at once, the red tablets should

be added immediately in any case. [See under (3): *Cleaning of dip*, or last paragraph below: *Submission of Samples*.] The addition of these tablets prevents any changes that may take place otherwise.

3. *Cleaning of dip*.—Fill the largest tube with the dip up to ½ inch from the top, leaving just enough space for shaking. Now pulverize two red tablets with the round wooden container, crushing them between the flat closed ends of the two parts. Add the powder to the dip in the tube, shake well for a couple of minutes, keeping the tube closed with the palm of the hand, and allow to stand for a quarter of an hour for the sediment to settle. The gas bubbles cause some of the sediment to float on top. When stirred with a straw, the gas escapes and the sediment sinks.

4. *Measuring off the cleaned dip*.—Two quantities must be measured off. First decant—i.e. pour off the clear liquid—a little more than 25 c.c. into the medium tube and then pour it into the empty bottle which was used for taking the original sample. Keep separately for subsequent oxidation test. Now measure off exactly 25 c.c. of the cleaned dip, again using the medium tube and pour into the large tube, which should, of course, first be rinsed. When the liquid is measured off, the lower edge of the meniscus (the convex surface) of the liquid in the tube should coincide with the mark indicating the volume.

5. The Actual Test.

(a) For Arsenite Only:

Add one white tablet to the 25 c.c. cleaned dip in the large tube, using small pieces at a time to prevent excessive effervescence. Now take the smallest tube, fill it with the testing fluid (iodine) up to the zero mark. Next add small quantities of this at a time to the dip to be tested. This causes a colour change from black to blue or brown, which disappears almost immediately owing to the iodine testing fluid reacting on the arsenite and changing it to arsenate; as soon as all the arsenite has been converted, the next drop causes a black colouring which does not disappear. The number of cubic centimetres of testing fluid used (called the iodometer reading) represents the arsenite content of the dip. Note the reading, say, A c.c., and, for calculation, see 5 (*c*).

(b) For Total Arsenic (Oxidation) Test, i.e. Oxidized Portion Included:

As has already been explained, the arsenite content is by no means an indication of the actual strength of the dip, since part of the arsenic may be changed into the arsenate form by bacterial action, or, in other words, become oxidized. By the test given under (*a*), the arsenite content only is determined. In order also to test for arsenate, the blue tablet is used, which converts it back to the arsenite form, in which form it responds to the testing fluid. The excess of blue tablet should then be removed as it also acts on the testing fluid. The removal takes place in an acid medium, while the iodometer reading is only taken from the titration after the acid has been neutralized by the addition of the white tablet. This part of the test is carried out as follows:—

Measure off exactly 25 c.c. of the cleaned dip (which was kept in the bottle for further tests) and pour into the large tube after the latter has been rinsed. Now, while the dip is still acid, add half a pulverized blue tablet, agitating the contents well by swinging the tube in a circle. Allow to stand for exactly 6 minutes.

Now immediately remove the excess of blue tablet by adding a little testing fluid at a time until it gives a permanent colour change which may vary from black and blue to brown. (Avoid adding too much, however.) The testing fluid now only acts on the excess blue tablet while the medium is acid. It does not matter exactly how much testing fluid is used, provided it is more than 2 c.c.; should less be used, the entire oxidation test must be repeated, a whole blue tablet being used, since the fact that so little fluid is used to remove the tablet shows that the dip is excessively oxidized and more blue tablet is needed to convert it back to arsenite.

After the blue tablet has been removed, one white tablet is added, small pieces at a time, and thereafter testing fluid from the smallest tube (filled up to the zero mark) until a permanent colour change is obtained as described under 5 (*a*). Note the reading, say, B c.c.—for calculation, see 5 (*c*).

(c) Calculation of the Strength of a Seven-day Dip:

For this the values required are those obtained under 5 (*a*) and 5 (*b*), as given above, i.e. A c.c. and B c.c. or, say, the actual values obtained, viz. 12 c.c. under 5 (*a*) and 21 c.c. under 5 (*b*).

In most cases, however, A and B happen to be equal, which means that the dip has not become oxidized. This always happens when more than, say, 100 animals per week are dipped.

In most other cases, and especially when dipping is carried out at longer intervals, oxidation can be expected.

If B exceeds A, a portion of the dip has become oxidized, i.e. we subtract A from B, and thus obtain the oxidized part, e.g. $B-A=C$ (say), or, if we take the values as 12 and 21 for A and B, respectively, then $21-12=9$, which means that the oxidized part is C or 9, and it is here obtained by subtracting the arsenite value from the total arsenic value. Now we assume that the oxidized part possesses two-thirds the effectiveness of ordinary arsenite, i.e. $\frac{2}{3}$ of $9=6$, and the 6 is added to the arsenite value 12 obtained under 5 (*a*); thus we get $12+6=18$. The strength of the dip according to the test is, therefore, 18, or, as we put it: the dip gives a corrected iodometer reading of 18. The iodometer reading (18 in this case) is now used to read from the tables the amount of dip or water required.

It should always be remembered that after the corrected value has been calculated, the total arsenic value will not exceed 20 after additions have been made. Should it be higher, however, another $6\frac{1}{4}$ gallons of water should be added for each iodometer reading by which the total arsenic exceeds 20.

After the corrected iodometer reading has been determined, Table II is used to make the corrections for a seven-day strength.

(d) Calculation of the Strength of a Fourteen-day Dip:

If the dip is oxidized, in the case of a fourteen-day strength, only the total arsenic value is taken as the iodometer reading, when Table III will show what has to be added. In this case the $\frac{2}{3}$ calculation is not used.

Summary and Diagrammatic Representation of Test.

Test for arsenite [cf. 5 (*a*)]: 100 c.c. dirty dip and 2 red tablets = clean dip; 25 c.c. of this + 1 white tablet + iodine testing fluid till black colour obtained, determine exactly what quantity has been used [see calculation under 5 (*c*)].

Test for total arsenic content [*oxidation test—cf.* 5 (*b*)]: 25 c.c. clean dip (obtained as above) + $\frac{1}{2}$ blue tablet (allow to stand for 6

minutes) + iodine testing fluid until changed to black, should take a little more than 2 c.c. (the actual quantity used is immaterial since it is only used to destroy the blue tablet) + 1 white tablet + iodine testing fluid until black colour obtained; now determine exactly what quantity has been used. The strenght is calculated as explained in 5 (*c*), and Table II or III is used to determine how much should be added.

Bacteria in Dipping Tank.

As_2O_3 Arsenite form → **+white tablet Iodine testing fluid.** → **As_2O_5 Arsenate or oxidized form.**

+blue tablet while acid (red tablet added)

The test is, therefore, based on a conversion (oxidation) of the arsenc trioxide (As_2O_3) by means of iodine, to the pentoxide (As_2O_5). Bacteria do the same in the dipping tank, however, especially where few cattle are dipped or where the intervals between dippings are longer than a week. If a portion of the dip has been converted to the inactive form (As_2O_5) by bacteria, it should first be converted back to the arsenite form (As_2O_3) by means of the blue tablet in the acid medium (red tablet), before the actual strenght can be determined.

Official Dipping Strengths.

Three-day strength 0·08% As_2O_3..........	16 ounces of sodium arsenite per 100 gallons of water.
Seven-day strength 0·16% As_2O_3..........	32 ounces (or 2 lb.) of sodium arsenite per 100 gallons of water.
Fourteen-day strength 0·24% As_2O_3.......	48 ounces (or 3 lb.) of sodium arsenite per 100 gallons of water.

A three-day strength signifies that with that particular strength dipping takes place at 3-day intervals. It is very seldom used, since for all practical purposes the seven-day strength is also used for all shorter than weekly intervals.

The seven-day strength is actually the most convenient strength, since weekly dipping is quite possible from a practical point of view and since a week is also the required interval for the general control of ticks.

The fourteen-day strength with fortnightly intervals is not recommended for the géneral control of ticks, because the life cycle of most ticks is such that after dipping they can climb up, engorge and drop off again before the next dipping takes place. Only during the winter months, when the duration of the life cycle is extended, dipping at fortnightly intervals can be resorted to. In the circumstances the dipping can just as well be carried out with the seven-day strength, which under normal conditions is able effectively to control ticks, provided dipping with the fourteen-day dip has not been prescribed.

Nature of Dip.

Dip containing 80% As_2O_3 is sold in powder form under various trade names as sodium arsenite, and dip containing 64, 48 and 25% As_2O_3 in fluid form as patent dips, also under various names and by various firms. The only difference between the four kinds is that in the last three the sodium arsenite is already dissolved and in the first the farmer must dissolve it in boiling water himself. The farmer naturally pays more for the convenience that it is ready dissolved and this is, in fact, the only advantage.

TABLE I.

Dips with the following arsenic contents	80% As_2O_3 (powder).	64% As_2O_3 (fluid)	48% As_2O_3 (fluid).	25% As_2O_3 (fluid).
Weight of sodium arsenite in 1 gall. fluid dip	Powder all present in form of sodium arsenite	8 lb.	6 lb.	$3\frac{1}{3}$ lb
Quantity of dip used when freshly mixed, i.e. dilution for— 7-day......................	2 lb. per 100 gall.	1 gall. per 400 gall. water	1 gall. per 300	1 gall. per 156
14-day......................	3 lb. per 100 gall.	1 gall. per 267 gall. water	1 gall. per 200	1 gall. per 104
Quantity of dip added per 100 gall. for each iodometer reading the dip 's too weak. The same for 7-day and 14-day strengths	2 ounces	$2\frac{1}{2}$ fluid ounces	$3\frac{1}{2}$ fluid ounces	$6\frac{2}{3}$ fluid ounces.
Quantity of water added per 100 gall. for each iodometer reading the dip is too strong	For a 7-day strength it is $6\frac{1}{4}$ gall., whichever dip is used.			
	For 14-day strength $4\frac{1}{6}$ gall.			

In all of them the tick-killing constituent is arsenic only, in the form of sodium arsenite. By merely looking at the label, therefore, to see what the As_2O_3 content is, one can determine with the aid of the above table which dip will be most economic to buy. The particulars given on this table will enable one to mix the dip anew without any further tablets and to bring it up to correct strength after having tested it. For convenience' sake, however, one can, when one knows the iodometer reading, adjust the strength of the dip with the aid of the tables that are given further on.

All the various cattle dips can be mixed and tested by means of the tester. If, for instance, one of the 64% As_2O_3 dips has formerly been used and you now wish to add sodium arsenite, you test in the ordinary way and use the table for sodium arsenite (containing 80% As_2O_3) to determine how much should be added.

TABLE II.

Table for the Correction of a Dip of Seven-day Strength:

The total arsenic content must, after the correction has been made, not exceed 20 in the case of an oxidized seven-day dip.

Column A gives the iodometer reading, and the corresponding figure in column B indicates how much sodium arsenite (arsenite of soda containing 80% As_2O_3) or water should be added for the particular iodometer reading in order to give a dip of the correct seven-day strength. Similarly, column C is used if it is desired to add one of the patent dips containing 64% As_2O_3. In case a dip containing 48% As_2O_3 is used, column D should be referred to. Should your choice fall on a patent dip containing 25% As_2O_3 column E will show what must be added.

Example: Presuming that the corrected iodometer reading is 10, then 12 ounces of sodium arsenite (80% As_2O_3) should be added. In the case of a 64% As_2O_3 dip, it should be 15 fluid ounces, and in the case of 48% and 25% As_2O_3 dips it should be 20 and 38 fluid ouces, respectively.

An iodometer reading of 16 means that the dip contains 0·16% As_2O_3, which is the correct seven-day strength. In the case of a 14-day dip, the iodometer reading is 24, i.e. it contains 0·24% As_2O_3. An iodometer reading of 1 therefore represents 0·01% As_2O_3.

TABLE II.

Correction of a Seven-day Strength.

16 ounces = 1 lb. (Powder). 20 fluid ounces = 1 pint. 8 pints = 1 gallon.

A.	B.	C.	D.	E.
Iodometer reading in ccs.	80% As_2O_3 (Powder dip). Add per 100 gallons dip in tank.	64% As_2O_3 (Fluid dip). Add per 100 gallons dip in tank.	48% As_2O_3 (Fluid dip) Add per 100 gallons dip in tank. (Approximated to 1 fl. ounce).	25% As_2O_3 (Fluid dip) Add per 100 gallons dip in tank. (Approximated to 1 fl. ounce).
0	See table I for original dilution.			
1	30 ozs. (powder)	37½ fluid ozs.	50 fluid ozs.	96 fluid ozs.
2	28 „	35 „	47 „	90 „
3	26 „	32½ „	43 „	83 „
4	24 „	30 „	40 „	77 „
5	22 „	27½ „	37 „	70 „
6	20 „	25 „	33 „	64 „
7	18 „	22½ „	30 „	58 „
8	16 „	20 „	27 „	51 „
9	14 „	17½ „	23 „	45 „
10	12 „	15 „	20 „	38 „
11	10 „	12½ „	17 „	32 „
12	8 „	10 „	13 „	26 „
13	6 „	7½ „	10 „	19 „
14	4 „	5 „	7 „	13 „
15	2 „	2½ „	3 „	6 „
16	i.e. correct seven-day strength.			

Quantity of water to be added for every 100 gallons in tank.
(Identical quantities for all four kinds of dip, in order to get a correct 7-day strength).

17	6¼ gallon. for all 4 kinds of dip.
18	12½ „ „ „ „ „ „ „
19	18¾ „ „ „ „ „ „ „
20	25 „ „ „ „ „ „ „
21	31¼ „ „ „ „ „ „ „
22	37½ „ „ „ „ „ „ „
23	43¾ „ „ „ „ „ „ „
24	50 „ „ „ „ „ „ „

i.e. add another 6¼ gallons water for every successive iodometer reading.

The manufacturers of the 25% As_2O_3 dips usually recommend their own dilutions which are weaker than those given here. Where dipping is not compulsory, the farmer can choose whether he wishes to dip or not. If the trouble of dipping is taken, however, it will be worth while to use a dip of the correct strength and to use it at the correct seven-day intervals as recommended above. Since all patent dips contain arsenic as their only tick-destroying constituent, dilution should be carried out according to the As_2O_3 content, as recommended above.

Examples for Calculation of the Amount of Dip or Water to be added per tank:

Assuming that the following iodometer readings have been taken:—

Examples.	1.	2.	3.	4.	5.	6.
Arsenite—Under 5 (*a*)	8	14	3	12	10	8
Total arsenic—Under 5 (*b*)	15	20	21	12	9	26
Corrected value—Under 5 (*c*)	13	18	15	12	10	20

Example No. 1: The corrected iodometer reading of 13 is obtained as follows: 15 minus 8 gives 7, and two-thirds of 7 is approximately 5, which is then added to 8, giving 13. This calculation is usually written as follows: $15 - 8 = 7$, and $\frac{2}{3}$ of $7 = 5$ (approximately) which is added to 8 and gives 13, or summarized, the corrected iodometer reading $C = A + \frac{2}{3}(B - A)$ or according to the example $C = 8 + \frac{2}{3}(15 - 8) = 13$ approximately. According to Table II, column B, 6 ounces of sodium arsenite or, say, $7\frac{1}{2}$ fluid ounces of a 64% dip should be added to every 100 gallons. For a dipping tank with a capacity of, say, 3,700 gallons it should, therefore, be $6 \times 37 = 222$ ounces, i.e. 13 lb. 14 oz. sodium arsenite or $7\frac{1}{2} \times 37$ fluid ounces, i.e. $277\frac{1}{2}$ fluid ounces = 13 pints $17\frac{1}{2}$ fluid ounces of a 64% As_2O_3 dip should be added.

Example No. 2. For an iodometer reading of 18, $12\frac{1}{2}$ gallons of water should be added for every 100 in the tank at the time, i.e. for a 3,700 gallon tank it is $12\frac{1}{2} \times 37 = 462\frac{1}{2}$ gallons.

Example No. 3: Although the corrected value is only 15, the total arsenic content is 21, and for a seven-day strength a value of not more than 20 is allowed for total arsenic; therefore add $6\frac{1}{4}$ gallons of water for every 100, i.e. $37 \times 6\frac{1}{4} = 231\frac{1}{4}$ gallons for a 3,700 gallon tank.

Example No. 4: The dip is not oxidized at all, therefore we simply take the arsenite value 12 as the iodometer reading, i.e. 8 ounces of sodium arsenite must be added per 100 gallons, and for a 3,700 gallon tank 8×37 ounces $= 18\frac{1}{2}$ lb.

Example No. 5: The total arsenic value cannot be less than the arsenite content; too much testing fluid was therefore added when the oxidation test was carried out to neutralize the effect of the blue tablet. In any case the dip has not been oxidized and the calculation is made on the iodometer reading 10; i.e. 12×37 ounces $= 27\frac{3}{4}$ lb. sodium arsenite is added for a 3,700 gallon tank.

Example No. 6: The corrected value is 20, i.e. according to Table II, $4 \times 6\frac{1}{4}$, i.e. 25 gallons of water must be added to obtain a correct seven-day strength. The total arsenic value will then still be 22, since the addition of $6\frac{1}{4}$ gallons brings the iodometer reading 1 down, and it should not be more than 20; another $2 \times 6\frac{1}{4}$, or $12\frac{1}{2}$ gallons, should therefore be added. The total quantity that has to be added is therefore $25 + 12\frac{1}{2}$, i.e. $37\frac{1}{2}$ gallons to fulfil all requirements. For a 3,700 gallon tank $37 \times 37\frac{1}{2}$, or $1,387\frac{1}{2}$ gallons of water should therefore be added.

N.B.—If the quantity of water to be added is too large for the tank, a portion of the dip must simply be bailed out. In such a case account should be taken of the reduced contents of the tank, which will then no longer be 3,700, but less. If the test is carried out as recommended, i.e. if the dip is tested for arsenite as well as

for arsenate, this hypothetical position will never arise. If the oxidation test is not carried out, however, the above can be expected.

Warning.—Both the owner of the dipping tank and the field staff are warned to carry out the complete test, in order to avoid legal proceedings being taken in case any animal should die as a result of too strong a dip.

TABLE III.

Fourteen-day strength.—The total arsenic content should not be more than 24 for this strength; i.e., in this case no use is made of a corrected value, but only of the total arsenic content when the dip has been oxidized.

In the case of an iodometer reading of 16 and less, Table II is used and to the quantity which, according to this table, should be added to every 100 gallons, another 16 ounces of sodium arsenite is added in order to get a fourteen-day strength. Should a 64% dip be used, 20 fluid ounces should be added; in the case of a 48% dip, 27 fluid ounces, and 51 in the case of a 25% dip.

With an iodometer reading of 17 and more Table III is used.

Example: Assuming that the arsenite value is 8 and the total arsenic 10, only the total arsenic content of 10 is worked on for a fourteen-day strength, as explained. Now, according to Table II, for an iodometer reading of 10, another 12 ounces of sodium arsenite (80% As_2O_3) must be added in order to obtain a correct fourteen-day strength. To the correct seven-day strength another 16 ounces must be added, i.e. 12+16=28; or for a 3,700 gallon tank 28×37=1,036 ounces=64 lb. 12 ounces must be added to obtain a correct fourteen-day strength.

TABLE III.—*Fourteen-day strength.*

A.	B.	C.	D.	E.
Iodometer reading in cc.	80% As_2O_3 (Powder dip) Add per 100 gallons dip in tank.	64% As_2O_3 (Fluid dip) Add per 100 gallons dip in tank.	48% As_2O_3 (Fluid dip) Add per 100 gallons dip in tank. (Approximated to 1 fluid ounce).	25% As_2O_3 (Fluid dip). Add per 100 gallons dip in tank. (Approximated to 1 fluid ounce).
16	and less. Use Table II as explained in previous paragraph.			
17	14 ozs. powder	17½ fluid ozs.	23 fluid ozs.	45 fluid ozs.
18	12 ,,	15 ,,	20 ,,	38 ,,
19	10 ,,	12½ ,,	17 ,,	32 ,,
20	8 ,,	10 ,,	13 ,,	26 ,,
21	6 ,,	7½ ,,	10 ,,	19 ,,
22	4 ,,	5 ,,	7 ,,	13 ,,
23	2 ,,	2½ ,,	3 ,,	6 ,,
24	i.e. correct fourteen-day strength.			

Quantity of water to be added for every 100 gallons in tank.
(The same for all our kinds of dip to obtain a correct fourteen-day strength).

25	4⅙ gallon. for all four kinds of dip.
26	8⅓ ,, ,, ,, ,, ,, ,, ,,
27	12½ ,, ,, ,, ,, ,, ,, ,,
28	16⅔ ,, ,, ,, ,, ,, ,, ,,
29	20⅚ ,, ,, ,, ,, ,, ,, ,,
30	25 ,, ,, ,, ,, ,, ,, ,,

i.e. add another 4⅙ gallon water for every successive iodometer reading.

Submission of Samples.

In case you are not satisfied with your own test, especially if the dip is very much oxidized, send a sample to the Director of Veterinary Services, P.O. Onderstepoort, for a free test. Send it in an empty testing fluid bottle (or another bottle of approximately the same size) and add 2 pulverized red tablets. Enclose full particulars, such as name and address of owner, dip used, what strength is required and date on which sample was taken. Also submit these particulars in a separate covering letter.

Application for new instructions.—The field staff are advised to encourage everybody who possesses a tester to order the new instructions, which are supplied free of charge, from the Director. The amended instructions are intended in particular to set out in a simpler manner, the procedure to be followed and to remove the difficulties presented by the determination of the total arsenic content (oxidation test).

Nile Grass *(Acroceras macrum)*. [*Continued from page 507.*

Taking into consideration that this grass grows well in the Sourveld areas of the Eastern Transvaal, where crops such as lucerne generally fail, the value of this grass in these areas can hardly be overestimated.

Acroceras is a grass which is still comparatively unknown, yet it will undoubtedly play an important part in future in the proper feeding of farm animals in the high rainfall areas of the Union.

References.

(1) Pasture Research in South Africa: Progress Report No. 1.
(2) Morrison, F. B.—Feeds and Feeding.

Winter Cereal Grazing for Milk Production:—

[*Continued from page 520.*

The results obtained in the above-mentioned experimental work clearly reveal that the most effective use of winter cereal grazing is obtained by limiting the grazing period per day. Apart from the availabality of grazing, the degree of limitation will depend on the production level of the cows, such as, for example, to one hour's grazing plus 20 lb. of lucerne hay per cow per day in the case of cows yielding up to 2½ gallons of milk; to three hours' grazing plus 20 lb. lucerne hay per cow per day in the case of cows producing 2½ to 3 gallons, etc. Besides offering the advantages of more effective use of the nutrients of these crops by the limitation of the grazing period, the carrying capacity is also considerably increased. Furthermore, considerably less trampling takes place and in many cases pasture management is facilitated.

Where wheat is produced for grain purposes the same grazing system can be applied, provided that the wheat should preferably be grazed only once; this grazing takes place before the pipe stage has been reached so that a grain crop can still be obtained. The decrease in the grain yield after one judicious grazing will be 7 to 10 per cent. at the utmost.

Official Milk Records.

Herd Averages for Registered Cows during 1942-3.

The average milk and butterfat records for registered herds officially tested during the year 1 September 1942, to 31 August 1943, are given hereunder. These figures are only in respect of registered herds of which all cows have been tested, and the records of all cows which completed a lactation during the period under review, are included. The records of cows in respect of which permission to withdraw has been granted in terms of Regulation 3 (*b*) of Government Notice No. 1430 of 1940, or which have died or were sold or were recorded for less than 120 days, have been omitted in calculating the herd averages. Herds of fewer than five cows and herds of which cows were withdrawn due to the shortage of feed are not included in these averages.

NAME AND ADDRESS OF OWNER.	Milk, lb.	Butterfat, %.	Butterfat, lb.	Days.	NUMBER OF COWS.						
					Mature.	Snr. 4.	Jnr. 4.	Snr. 3.	Jnr. 3.	2 Years.	Total.
FRIESLAND HERDS.											
L. B. Southey, Lenton Grove, Steynsburg, C.P.	14,321·0	3·792	542·986	300	7	2	—	2	—	—	11
T. E. Murray & Sons, Roodebloem, Graaff Reinet, C.P.	11,804·9	4·260	502·899	290	8	—	2	2	2	7	21
A. A. Potgieter, Zion, Danielsrust, O.F.S	13,352·3	3·689	492·520	300	8	1	—	—	—	1	10
S. L. van Niekerk, Kamnatie Loop, Oudtshoorn, C.P.	13,124·0	3·615	474·468	294	6	—	1	—	—	—	7
Mrs. K. M. Drysdale, Mackenzie Farm, Roodekop, Tvl.	13,098·2	3·538	463·432	298	5	1	2	1	3	4	16
Sir de V. Graaff, Bart, De Grendel, P.B. Cape Town, C.P.	13,197·7	3·420	451·326	295	15	5	7	4	3	9	43
P. H. Steyn, Holbrook, New England, C.P.	12,135·3	3·689	447·649	300	—	—	3	1	1	—	5
Frasers, Ltd., Aanvang, Jammersdrift, O.F.S.	11,945·2	3·638	434·608	294	10	—	3	2	5	6	26
A. A. Kingwill & Sons, Colonies Plaats, Graaff Reinet, C.P.	11,163·5	3·818	426·170	269	5	4	3	8	1	2	23
T. B. Jordaan, Buffelsfontein, Somerset East, C.P.	11,568·3	3·677	425·408	300	5	—	1	2	1	5	13
A. E. Murray & Sons, Bloemhof, Glen Harry, C.P.	10,957·8	3·876	424·777	300	2	1	1	1	2	6	13
S. L. S. Cloete, Malangskraal, Bedford, C.P.	10,879·3	3·897	423·926	299	10	1	2	2	3	7	25
H. Geyer, P.O. Box 221, Bethal, Tvl	12,165·9	3·480	423·400	300	6	—	—	—	—	—	6
Van Niekerk Bros., Brakfontein, Bedford, C.P.	11,215·4	3·745	419·981	300	7	10	8	5	1	27	58
College of Agriculture, Potchefstroom, Tvl.	12,075·6	3·456	417·389	300	3	1	1	—	—	—	5
Mental Hospital, Bloemfontein, O.F.S.	12,536·2	3·328	417·174	300	12	1	2	—	—	—	15
S. D. le Roux & Son., Onverwag, Oudtshoorn, C.P.	12,034·0	3·460	416·332	297	3	1	2	1	1	2	10
E. H. le Roux & Son, Dirko, Cookhouse, C.P.	11,266·4	3·689	415·604	300	8	4	3	7	4	12	38
Stellenbosch–Elsenburg College of Agriculture, P.O. Muldersvlei, C.P.	11,465·0	3·522	403·745	300	10	1	5	16	2	10	44
School of Agriculture, Tweespruit, O.F.S	10,126·6	3·973	402·314	297	5	—	—	1	4	—	10
A. A. Montgomery, Hillside, Vineyard, C.P.	10,795·6	3·721	401·724	300	4	1	1	8	—	2	16
W. J. H. Spence, Pomona, P.O. Box 66, Marquard, O.F.S.	11,668·5	3·426	399·815	298	4	1	—	2	1	8	16
P. W. Michau, Doornhoek, Cradock, C.P.	9,972·1	3·938	392·736	297	7	—	—	4	3	—	14

Marlow Agricultural Training School, Cradock, C.P.	10,065·5	3·898	392·341	291	6	—	1	—	—	—	7
Grootfontein College of Agriculture, Middelburg, C.P.	10,920·7	3·565	389·341	295	9	4	—	3	—	5	21
S. Fourie, P.O. Box 142, Oudtshoorn, C.P.	11,836·6	3·275	387·630	282	3	2	2	—	—	3	10
Geo. Dunbar, P.O. Box 11, Delmas, Tvl.	11,304·5	3·413	385·789	300	12	4	4	7	1	19	47
W. J. J. Moolman, Grootspruit, Val, Tvl.	10,852·4	3·528	382·828	294	13	—	1	1	—	3	18
W. Greenblatt, Shangrila, P.O. Box 8, Val, Tvl.	11,066·3	3·458	382·625	300	8	1	—	2	2	1	14
C. Schwartz, Corona, P.O. Box 7, Virginia, O.F.S.	10,647·8	3·582	381·450	300	1	4	—	4	1	2	12
M. Naude, McCabespruit, Clocolan, O.F.S.	9,512·2	4·008	381·252	291	12	1	2	1	2	3	21
Agricultural Research Institute, Experimental Farm, Pretoria, Tvl.	10,823·5	3·493	378·031	292	3	—	—	6	—	2	11
A. J. H. Vosloo, Klipfontein, Bedford, C.P.	10,049·3	3·746	376·437	297	5	—	1	3	—	3	12
H. G. H. Brown, Schaffhausen, Waku, C.P.	10,675·3	3·465	369·944	300	4	—	—	1	—	1	6
D. W. du Preez, P.O. Box 20, Standerton, Tvl.	10,257·6	3·596	368·837	300	5	—	—	1	—	—	6
Geo. Fergusson, P.O. Box 449, Benoni, Tvl.	10,705·2	3·417	365·772	298	8	1	2	5	—	3	19
Mrs. S. Brown, Spitskop, Meadows, O.F.S.	10,507·6	3·478	365·491	300	2	5	2	—	3	—	12
N. R. Torr, Mountain View, Burghersdorp, C.P.	9,834·8	3·688	362·995	293	2	—	—	—	1	2	5
H.W. Stockdale, Alma, Clocolan, O.F.S.	9,976·6	3·623	361·417	296	16	3	2	3	1	2	27
M. A. Prinsloo, Vlakkraal, Florisbad, O.F.S.	9,243·9	3·879	358·607	297	2	1	—	1	—	6	10
Durban North Dairy, 179 High Ridge Road, Durban North, Natal	10,341·1	3·463	358·182	298	3	1	—	1	—	1	6
Kiddie Bros., Rooidam, Modder River, O.F.S.	10,710·5	3·307	354·199	291	4	—	2	2	1	8	17
Ed. Starke, Joostenburg, Muldersvlei, C.P.	9,529·6	3·615	344·511	299	6	2	—	6	2	10	26
E. Stephenson, P.O. Box 3, Lady Grey, C.P.	9,163·2	3·710	339·930	291	4	2	3	4	—	—	13
Dodds Bros., Thibet Park, Waverley, C.P.	8,763·3	3·865	338·724	291	4	1	—	1	2	5	13
P. Olivier, The Towers, Oudtshoorn, C.P.	10,683·2	3·165	338·076	298	5	—	4	5	4	1	19
H. F. Naude & Son, Goree, Robertson, C.P.	10,601·6	3·181	337·195	290	6	2	1	—	—	1	10
R. L. Gilson, Hermon, Franklin, E. G.	9,812·6	3·433	336·844	300	—	—	2	3	7	3	15
W. M. Pfaff, P.O. Box 125, Ermelo, Tvl.	9,883·0	3·402	336·197	300	1	—	—	—	—	4	5
Mental Hospital, Queenstown, C.P.	9,847·8	3·407	335·508	298	8	—	2	2	7	9	28
Estate late J. I. Starke, P.O. Muldersvlei, C.P.	9,208·8	3·631	334·335	288	3	2	—	1	1	3	10
J. J. J. van Rensburg & Son, Erfdeel, P.O. Box 10, Hennenman, O.F.S.	9,424·4	3·548	334·332	300	2	—	—	2	2	2	8
College of Agriculture, Glen, O.F.S.	9,235·1	3·614	333·760	290	6	1	—	1	2	3	13
E. Emmott, P.O. Midway, Tvl.	9,856·1	3·370	332·176	260	7	2	2	—	1	—	12
J. Abrams, Holfontein, Kinross, Tvl.	8,931·7	3·704	330·847	287	7	1	—	—	2	4	14
O. H. Kiessig, Hartmanshoop, Philippolis, O.F.S.	9,175·3	3·580	328·439	262	4	2	1	—	4	2	13
D. J. Marais, Marloura, Glenroy, Tvl.	10,105·4	3·220	325·394	276	2	1	—	1	—	1	5
A. Neizel, Erasmusdam, Glenisla, Natal	9,268·5	3·439	318·719	299	6	—	1	2	1	2	12
D. P. G. du Toit, Wakkerstroom, Bonnievale, C.P.	9,922·1	3·211	318·631	281	5	—	—	1	1	1	8
J. S. Basson, Rheboksfontein, Darling, C.P.	10,044·8	3·158	317·231	293	5	1	—	1	—	1	8
G. van der Watt, Karreedam, P.O. Box 74, Marquard, O.F.S.	8,261·0	3·813	314·983	294	—	1	—	—	—	4	5
F. J. van Zyl, Langverwacht, Bonnievale, C.P.	8,745·1	3·590	313·933	299	4	3	3	3	3	7	23
Field-Marshal J. C. Smuts, Doornkloof, Irene, Tvl.	9,002·5	3·469	312·331	287	7	2	1	4	4	2	20
A. and E. G. Wevell, P.O. Box 59, Bethal, Tvl.	9,246·6	3·366	311·227	288	6	—	1	—	1	—	8
P. Hourquebie, Rosetta, Natal	8,949·5	3·470	310·580	297	9	3	9	2	7	6	36
Baynesfield Estate, Nels Rust, Natal	8,257·8	3·738	308·675	296	58	8	11	10	8	4	99
J. J. Starke, P.O. Muldersvlei, C.P.	8,952·0	3·425	306·577	285	6	—	—	1	—	7	14
Hoogenboesem Bros., P.O. Box 5949, Johannesburg, Tvl.	9,347·1	3·269	305·587	290	7	—	3	4	3	9	26
Dr. C. R. Henning, P.O. Box 23, Devon, Tvl.	8,343·1	3·651	304·585	297	1	1	—	—	—	3	5
Valkenberg Mental Hospital, Observatory, C.P.	9,260·0	3·233	299·357	285	6	1	—	1	3	2	13
H. Oelrich, Oelrietta, P.O. Box 4, Tweespruit, O.F.S.	8,272·2	3·615	299·071	294	2	—	—	—	1	2	5
J. H. le Roux & Son, Bakenskraal, Oudtshoorn, C.P.	8,173·9	3·646	298·047	289	24	10	7	5	3	17	66

NAME AND ADDRESS OF OWNER.	Milk, lb.	Butterfat, %.	Butterfat, lb.	Days.	NUMBER OF COWS.						
					Mature.	Snr. 4.	Jnr. 4.	Snr. 3.	Jnr. 3.	2 Years.	Total.
G. J. Veenstra, Shirley, Mooi River, Natal	8,578·1	3·471	297·770	299	15	2	6	3	2	8	36
R. R. Cullinan, Olifantsfontein, Tvl.	8,894·9	3·335	296·680	290	6	1	—	—	—	—	7
J. A. Rautenbach & Co., Eden, P.O. Box 142, Kroonstad, O.F.S.	7,380·0	4·012	296·112	288	34	5	2	4	4	17	66
H. W. G. Dangers & Sons, Kammanassie Dam, Oudtshoorn, C.P.	8,143·4	3·618	294·610	274	3	—	1	—	—	2	6
J. N. le Roux, Jnr., De Luc, Vinies, O.F.S.	8,040·1	3·656	293·940	237	3	3	—	2	1	2	11
D. Finnemore, Koppieskraal, Theunissen, O.F.S.	8,210·7	3·571	293·179	268	5	1	—	3	—	1	10
Jack Starke, Easthill, Muldersvlei, C.P.	8,387·2	3·492	292·901	298	6	2	5	1	5	8	27
M. Schultz, P.O. Box 71, Davel, Tvl.	8,620·9	3·290	283·645	299	5	3	2	—	1	5	16
D. S. E. Marais, Fern Grove, Lady Grey, C.P.	7,391·3	3·758	277·792	282	1	1	1	1	3	2	9
C. E. Sherwood, P.O. Box 53, Davel, Tvl.	7,461·2	3·720	277·557	284	17	1	5	12	3	13	51
W. J. de Wet, Paucitlora, Lindley, O.F.S.	7,476·1	3·659	273·546	281	5	—	2	1	1	1	10
E. D. Ralfe, Heavitree, Estcourt, Natal	7,505·5	3·574	268·283	300	2	1	—	—	1	2	6
J. J. Gertenbach, Witfontein, P.O. Box 1, Philippolis, O.F.S.	7,232·8	3·612	261·214	285	1	—	2	—	1	4	8
A. Finnemore, The Beacon, Theunissen, O.F.S.	7,309·8	3·541	258·875	261	4	—	—	2	2	—	8
E. J. du Toit, Celidon, Barkly East, C.P.	7,367·1	3·483	256·613	286	3	1	1	1	1	—	7
S. G. Basson, Doornfontein, Malmesbury, C.P.	7,074·0	3·610	255·381	293	3	—	2	2	3	5	15
R. & G. Usher, P.O. Box 3, Balfour, Tvl.	7,135·1	3·519	251·075	256	16	5	1	2	3	—	27
W. P. Harris & Sons, P.O. Box 249, Kimberley, C.P.	7,021·9	3·514	246·784	179	7	3	3	2	2	5	22
P. H. Viljoen, Geluk, P.O. Box 106, Clocolan, O.F.S.	6,258·5	3·856	241·311	265	2	—	1	—	2	5	10
J. M. Potgieter, Amor, Danielsrust, O.F.S.	6,392·8	3·770	241·006	250	6	—	—	—	—	—	6
E. J. Harrison, Fountain Hall, Rosetta, Natal	6,474·1	3·669	237·535	300	1	—	—	2	3	2	8
Industrial School, Heidelberg, Tvl.	6,765·0	3·499	236·699	291	7	—	—	—	—	—	7
Thos. Leask & Co., Highlands, Wolmaransstad, Tvl.	7,155·2	3·301	236·195	297	8	3	1	—	—	—	12
R. J. Judd, P.O. Box 27, Springs, Tvl.	6,787·1	3·415	231·809	266	4	3	2	1	1	1	12
I. P. Meyer, Mareuil, Bethlehem, O.F.S.	6,396·4	3·593	229·831	247	4	—	—	—	—	2	6
A. J. Combrink, Bloubank, Edenburg, O.F.S.	6,676·3	3·437	229·494	211	—	1	—	1	1	3	6
Industrial School, Meadows, O.F.S.	6,029·3	3·664	220·941	280	4	—	—	—	1	—	5
Miss T. Vigne, Rust-en-Vrede, P.O. Box 107, Kimberley, C.P.	6,153·4	3·588	220·761	264	6	2	1	1	1	2	13
O. W. Vice, Wynnedale, Molteno, C.P.	5,863·8	3·707	217·364	273	2	1	—	—	1	2	6
N. C. Havenga, Allanvale, Memel, O.F.S.	5,672·9	3·749	212·666	270	6	1	1	2	3	2	15
Danie Joubert, Beltana, Stellenbosch, C.P.	5,625·3	3·694	207·832	296	4	1	—	—	—	—	5
W. A. Shaw, Shaftesbury, Westminster, O.F.S.	5,745·8	3·411	196·006	272	2	3	1	3	4	2	15
L. G. Gertenbach, Grootfontein, Philippolis, O.F.S.	5,415·7	3·558	192·668	262	4	5	1	3	6	4	23
A. B. Lombard, Omega, Clocolan, O.F.S.	5,164·5	3·712	191·722	241	3	—	1	2	3	1	10
Dr. C. M. Rautenbach, P.O. Box 43, Bloemfontein, O.F.S.	5,132·6	3·417	175·402	265	9	2	1	1	—	2	15
F. J. van Zyl & Sons, Buffelsvlei, Colesberg, C.P.	4,675·5	3·639	170·120	184	7	1	—	1	1	5	15
Dr. J. C. Pretorius, Hoëveldboerdery, Lynchfield, O.F.S.	4,421·3	3·631	160·520	249	8	1	1	1	5	1	17
L. C. Serfontein, Geduld, Bosrand, O.F.S.	4,241·3	3·597	152·558	258	7	1	3	1	1	—	13
Harrowdene Estate, P.O. Box 6101, Johannesburg, Tvl.	3,317·9	3·579	118·741	222	9	3	—	—	—	2	14
J. P. Beket, Erfdeel, Lindley, O.F.S.	3,083·9	3·181	98·098	141	7	1	—	2	—	3	13

JERSEY HERDS.											
H. L. D. Wood, Jersey Farm, Retreat, C.P.	8,961·1	4·720	422·956	299	9	4	1	2	2	6	24
A. Luckhoff, Zuurplaats, Graaff Reinet, C.P.	7,268·8	5·788	420·708	293	2	—	2	2	1	5	12
Grootfontein College of Agriculture, Middelburg, C.P.	7,633·9	5·313	405·622	294	5	2	1	—	2	8	18
Rev. H. Hutton, Halaron, Selborne, C.P.	7,468·9	5·224	390·240	300	4	1	—	1	—	1	7
Mrs. J. W. Wright, Bowden Hall, Middelburg, C.P.	6,863·1	5·640	387·088	285	2	1	2	2	—	2	9
Marsh Memorial Homes, Rondebosch, C.P.	7,643·9	4·917	375·825	300	5	2	—	2	—	1	10
M. Hodgson, 17 Egerton Road, Kimberley, C.P.	7,363·2	5·018	369·456	300	2	—	—	—	2	1	5
Stellenbosch-Elsenburg College of Agriculture, Muldersvlei, C.P.	6,822·7	5·274	359·823	289	1	1	1	1	9	1	14
D. C. Stevens, Schuttes Draai, Gumtree, O.F.S.	5,908·8	6·060	358·097	300	4	—	—	—	—	2	6
J. Neil Boss, The Meadows, Hankey, C.P.	6,676·3	5·299	353·794	290	7	2	1	1	2	9	22
A. Nicholson, Schoongezicht, Stellenbosch, C.P.	7,085·3	4·863	344·565	299	4	1	—	2	—	3	10
R. Porritt, Kirkwood Jersey Stud Farm, 217 Alexandra Road, Pietermaritzburg, Natal	6,872·1	4·866	334·379	300	1	—	—	—	1	5	7
Wright Bros., Westoe, Highlands Rail, C.P.	6,280·3	5·268	330·816	297	4	1	—	—	—	4	9
H. F. C. Küsel, P.O. Harburg, Natal	6,793·8	4·861	330·253	300	4	—	—	—	1	1	6
C. T. Barlow, Vergelegen Estate, Somerset West, C.P.	6,505·1	5·029	327·112	293	2	—	1	2	1	7	13
Oakdale Agricultural Training School, Riversdale, C.P.	6,158·9	5·019	309·086	298	6	2	—	2	1	5	16
S. Hugo, Rust en Werk, Daljosaphat, C.P.	7,183·2	4·291	308·222	291	4	1	1	—	2	2	10
A. C. Jolly, Thorneycroft, Sevenfountains, C.P.	5,528·8	5·146	284·503	296	4	—	3	—	2	5	14
G. Nel, Zwagershoek, Lydenburg, Tvl.	5,830·5	4·789	279·245	300	—	—	—	2	1	3	6
G. R. Hugo, Solomonsvlei, Klein Drakenstein, C.P.	6,207·3	4·449	276·193	222	1	1	—	—	1	4	7
G. Vernon Crookes, Albany Grove, Hillcrest, Natal	5,064·6	5·218	264·280	298	19	2	3	2	2	16	44
F. Dammann, P.O. Box 39, Glencoe, Natal	5,118·6	5·129	262·552	266	4	—	—	3	—	1	8
C. H. Durham, P.O. Box 14, Dundee, Natal	5,154·5	4·863	250·657	278	7	1	—	2	1	3	14
Mrs. B. H. V. Handley, Normanby, P.B. Pietermaritzburg, Natal	4,570·3	5·334	243·781	247	11	3	3	1	1	—	19
A. G. Lovemore, P.O. Box 2, Sandflats, C.P.	4,355·0	4·792	208·690	267	4	—	2	1	—	—	7
A. J. Versfeld, Groote Post, Darling, C.P.	3,989·4	4·897	195·370	224	20	5	4	2	2	—	33
A. W. Wilmot, Zoo Kiosk, Johannesburg, Tvl.	2,363·5	5·245	123·964	150	2	—	—	—	—	4	6
SHORTHORN HERDS.											
H. T. C. Sills, Jnr., Sudbrook, Dordrecht, C.P.	9,295·1	4·301	399·803	292	3	1	1	2	1	2	10
A. P. Macaskill, Tweefontein, Lindley, O.F.S.	6,489·3	4·029	261·461	295	2	—	—	—	1	3	6
Baynesfield Estate, Nels Rust, Natal	6,168·4	3·886	239·695	297	4	—	4	—	1	—	9
King Bros., Primeston, Bedford, C.P.	5,684·5	4·132	234·910	264	10	1	5	2	—	1	19
R. W. C. Whitehead, Lucia, P.O. Box 235, Bethlehem, O.F.S.	5,625·6	4·004	225·252	285	9	1	—	1	1	2	14
P. J. de Wet, Grootschuur, Sterkstroom, C. P.	5,170·6	4·139	214·021	243	7	2	1	1	—	4	15
H. A. H. Smith, Woburn, Alice, C.P.	5,103·6	4·170	212·801	261	6	—	1	—	—	1	8
W. Minnaar, P.O. Box 22, Bethulie, O.F.S.	5,048·2	4·054	204·639	291	4	—	2	2	6	1	15
F. W. Dell, Edina, Kaallaagte, O.F.S.	4,226·1	4·048	171·071	240	3	—	—	1	1	2	7
J. E. Newlands, Springholme, Creighton, Natal	4,359·8	3·866	168·556	281	7	2	1	1	1	4	16
AYRSHIRE HERDS.											
Montagu Simpson, P.O. Box 6245, Johannesburg, Tvl.	10,387·1	3·760	390·583	289	15	2	1	1	4	8	31
D. S. Fowler, Umgeni Poort, Nottingham Road, Natal	6,163·1	3·840	236·687	288	6	2	—	3	1	2	14
B. W. Reynolds, Hayfields, Glencoe, Natal	6,011·8	3·886	233·626	291	16	3	1	—	—	—	20

Name and Address of Owner.	Milk, lb.	Butterfat, %.	Butterfat, lb.	Days.	Number of Cows.						
					Mature.	Snr. 4.	Jnr. 4.	Snr. 3.	Jnr. 3.	2 Years.	Total
RED POLL HERDS.											
Parker Bros., Melrose, Eastpoort, C.P.	9,062·7	3·628	328·830	300	14	2	—	—	—	7	23
F. M. Howarth, Sweetkloof, Alicedale, C.P.	5,450·9	4·082	222·489	256	6	—	2	—	2	1	11
Dohne Experimental Station, Dohne, C.P.	4,948·6	4·144	205·080	273	10	5	1	—	2	2	20
GUERNSEY HERDS.											
H. J. van Aarde, P.O. Bainsvlei, Bloemfontein, O.F.S.	8,588·6	4·255	365·424	289	8	—	1	—	2	3	14
College of Agriculture, Potchefstroom, Tvl.	5,255·4	4·562	239·775	246	2	—	—	1	1	1	5
SOUTH DEVON HERDS.											
W. S. Stein, Fairbreeze, Nellie Valley, Natal	5,132·4	4·930	253·018	276	4	—	—	—	1	—	5
BROWN SWISS HERDS.											
Ray Sephton, Pit Lochrie, New England, C.P.	9,489·9	3·812	361·753	292	3	—	—	1	—	1	5

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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* Price Review for June, 1944.

Kaffircorn.—Large supplies were marketed, especially during the first half of the month, and prices began to decline. Towards the end of the month, however, prices were more stabilized. K^1 and K^2 averaged 16s. 10d. per bag free-on-rail for June as against 18s. and 18s. 6d. per bag, respectively, for the previous month.

Dry beans.—As a result of the poor crop, offerings of all varieties of dry beans were inadequate to meet the demand, and further record price advances were realized. Particular difficulty was experienced in obtaining supplies of sugar beans, whilst the demand for cowpeas also increased. On the Johannesburg market speckled sugar beans rose from 71s. 8d. per bag in May to 96s. 1d. in June: kidney beans from 54s. 5d. to 78s. 10d., and cowpeas from 37s. 11d. to 42s.

Hay.—Large supplies of Cape lucerne hay and teff, but mostly of an inferior quality, were offered. The demand was strong, and the best qualities were disposed of mostly at maximum fixed prices.

Potatoes.—Offerings decreased still further during the month, and towards the end of the month the position was even critical. In many cases the quality was poor, but as a result of the great existing shortage, practically all grades sold at the maximum fixed prices.

Onions.—Supplies were small to moderate, and consisted largely of Cape onions. On all markets prices advanced still further. Cape onions on the Cape Town market averaged 18s. 8d. per bag for June as against 15s. 6d. for May; 21s. 11d. on the Johannesburg market as against 19s. 10d. for May; and 22s. 11d. per bag on the Durban market as against 21s. 7d. for May.

Vegetables.—Offerings in general were moderate, but a few kinds like cabbages, pumpkins and sweet potatoes were relatively well supplied. The demand for all vegetables, however, increased as a result of the shortage of potatoes. A general rise in prices was therefore evident,

* All prices mentioned are averages.

Tomatoes.—Good supplies were present and consisted largely of Transvaal tomatoes, particularly towards the end of the month. Large quantities of Nat. Mark tomatoes were also offered, and prices on most markets declined somewhat. Nat. Mark No. 1 on the Johannesburg market was 4s. 10d. per tray, and ordinary tomatoes 2s. 6d. On the Cape Town market tomatoes averaged 4s. per tray for the month, and on the Durban market 1s. 8d. per tray.

Fruit.—Consignments of deciduous fruit decreased sharply during the month, and the offerings of apples were practically all out of cold storage. Oranges, and particularly navels, were again marketed in large quantities, and were readily disposed of. Naartjies were also well supplied. As regards tropical fruit, pawpaws were plentiful and prices in general receded. Nat. Mark on the Johannesburg market declined from 4s. 4d. per standard box for May to 3s. 8d. for June, and ordinary pawpaws from 3s. 5d. to 2s. 10d. Only on the Cape Town market was a slight advance in prices evident, viz., from 3s. 7d. per standard box to 3s. 11d. for June. Pineapples and avocados were moderately supplied and prices, particularly of avocados, advanced in general.

Eggs and Poultry.—Fresh eggs were still relatively scarce during the first half of the month. The position quickly improved, however, during the second half of the month, and prices began to decline. New-laid eggs averaged 3s. per dozen on the Johannesburg market, and 3s. 3d. per dozen on the Durban market for June. The supply of poultry was smaller than that of the previous month and prices generally were somewhat higher.

Index of Prices of Field Crop and Animal Products.

THIS index, which appears elsewhere in this issue, shows only a slight decrease as compared with the figure for the previous month, viz., from 167 to 166 for June.

The most important increases occurred in the groups:—

(a) Hay, viz., from 158 to 170.

(*b*) Other field crops (i.e., potatoes, sweet potatoes, onions and dry beans), viz., from 289 to the record level of 315 in June.

The most important decreases occurred in the groups:—

(*a*) Slaughter stock, viz., from 166 to 161.

(*b*) Poultry and poultry products, viz., from 273 to 257.

Agricultural Conditions in the Union during June, 1944.

THERE was a good distribution of winter rains throughout the country, except in the lowveld areas of Transvaal; in the southern coastal areas the precipitation was even unusually heavy. Very cold weather was experienced in all parts, and this was aggravated by strong westerly winds, especially in the western regions of the country. Severe frosts occurred fairly generally.

Livestock were in poor condition generally, especially in the grassveld areas, owing to the low nutritive value of the abundant but dry winter pasture, while the cold weather also had its effect on the animals. Very few stock diseases occurred.

Crops.—Farmers were still busy reaping maize and kaffircorn. In the western Transvaal and on the Springbok Flats an exceptionally good crop of *maize* was being reaped. In the remaining maize areas

of the country the yield was somewhat lower than that of the previous season. Yields of *kaffircorn* in general were good, except in parts of the highveld, Natal and Transkei.

Dry beans and *potatoes* everywhere yielded exceptionally poor crops. The *groundnut* crop of the Springbok Flats (Transvaal) was also somewhat lower than that of the previous season. *Vegetables* were seriously affected by the rains, cold weather and frosts. Much more *wheat* and other winter cereals were sown after the good winter rains. A shortage of labour and the small supplies of available seed wheat were, however, limiting factors in this respect, especially in the eastern O.F.S. In the Alexandria district a larger acreage of *chicory* was planted. A start was made with the cutting of *sugar cane* along the Natal coast, and a good crop is expected.

The Meat Control Scheme—Further Developments.

IN the previous issue of this journal a brief exposition was given of the Meat Control Scheme in the Union which came into operation on 10 May of this year. Subsequently, however, a few amendments and additions to the scheme were effected, viz., the following:—

Super Beef.—The number of grades of beef under the Scheme has been increased from five to six. The new grade introduced is super grade and is defined in *Government Gazette Extraordinary* of 23 June 1944. This grade is placed above prime, and special wholesale, retail and producers' prices have been fixed for it in the controlled areas. The price to the producer per 100 lb. warm dressed weight is as follows:—Cape Town, 73s.; Pretoria and Witwatersrand, 70s. 6d.; and the remaining controlled markets, 69s. 6d.

Seasonal Prices.—As was stated in the previous article, the intention is gradually to increase the producers' price of slaughter cattle during the last half of the year in order to compensate for increased costs in feeding during this time of the year. These prices have now been introduced for the present season and were announced in *Government Gazette Extraordinary* of 30 June 1944. To the fixed basic price of beef to the producer, 1s. per 100 lb. must be added during July; 2s. during August; 3s. during September, and 5s. during October and November.

Price of Offal.—As a result of a revision of the offal pool it has been found possible to secure for producers an extra 1s. per 100 lb. beef and ¼d. per lb. mutton and lamb in the Johannesburg area.

Maximum Retail Prices in Rural Areas.—As announced in *Government Gazette Extraordinary* of 7 July 1944, maximum retail prices for beef, mutton and lamb have also been fixed for all rural areas in the Union. This step was taken on account of the fact that prices of slaughter stock in the uncontrolled areas have continued to remain on a higher level than in the controlled areas and the latter, therefore, did not receive their rightful proportion of available slaughter stock; also to protect the consumer in rural areas against excessive high meat prices; to stabilize livestock and meat prices in rural areas; and, furthermore, to assure the success of the Scheme.

Levy on Slaughter Pigs.—As announced in *Government Gazette Extraordinary* of 7 July 1944, a levy has been imposed on all pigs slaughtered in municipal and other abattoirs or slaughter-poles which are controlled by a local authority. The levy is 1s. per pig for pigs of 2 months and older, and 3d. per pig under 2 months. The levy is payable to the Livestock and Meat Industries Control Board. As was pointed out in the previous article, the levy payable to the Board was formerly only on cattle, sheep and goats slaughtered.

Dairy Products—1944 Winter Season.

Increases in Prices and Subsidies.

IN the previous issue of this journal the prices of, and subsidies on, dairy products for the winter season commencing 1 May 1944 were given. Subsequently the Dairy Industry Control Board decided to increase some of these prices and subsidies, viz., as follows:—

Butterfat.—The subsidy on all grades of butterfat delivered by producers to creameries has been increased to 7d. per lb. as from 1 July 1944 and until further notice, which means that from this date producers will receive 2s. 2d., 2s. and 1s. 10d. per lb. for 1st, 2nd and 3rd grade, respectively. During the previous winter season the subsidy was increased from 3d. to 5d. per lb. butterfat from 1 July 1943, and to 6d. per lb. from 1 August 1943, to 31 October 1943.

Butter.—The wholesale and retail prices of creamery butter have been increased by 1d. per lb., as from 1 July 1944, to 1s. 9d., 1s. 7d. and 1s. 5d. per lb. for 1st, 2nd and 3rd grade, respectively, in the wholesale trade, and to 1s. 11d., 1s. 9d. and 1s. 7d. per lb. respectively in the retail trade.

Cheese Milk.—The subsidy on all cheese milk delivered by producers to cheese factories has been increased by ½d. per gallon (or 1½d. per lb. butterfat contained therein) to 2½d. per gallon (or 7d. per lb. butterfat contained therein) as from 1 July 1944.

Milk for Condensing Purposes.—The Board has also increased the producers' price of milk for condensing purposes by ½d. per gallon to 12½d. per gallon (or 2s. 11d. per lb. butterfat contained therein) as from 1 July 1944.

For more particulars regarding fixed prices for butter and milk for condensing purposes, see *Government Gazette Extraordinary* of 30 June 1944.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1st July to 30th June).	Summer Cereals. (*a*)	Winter Cereals. (*b*)	Hay. (*c*)	Other Field Crops (*d*)	Pastoral Products. (*e*)	Dairy Products. (*f*)	Slaughter Stock. (*g*)	Poultry and Poultry Products. (*h*)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938 39	92	107	96	89	79	102	106	92	9[illegible]
1939–40	86	107	77	95	115	105	106	89	103
1940–41	109	113	106	156	102	108	110	104	108
1941–42	121	134	143	203	102	131	134	145	123
1942–43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158
February	168	183	134	188	122	144	176	235	158
March	167	183	124	179	122	144	174	240	157
April	167	183	132	262	122	144	170	279	162
Ma	183	183	158	289	122	169	166	273	167
June	182	183	170	315	122	169	161	257	166

(*a*) Maize and kaffircorn.
(*b*) Wheat, oats and rye.
(*c*) Lucerne and teff hay.
(*d*) Potatoes, sweet-potatoes, onions and dried beans.
(*e*) Wool, mohair, hides and skins.
(*f*) Butterfat, cheese milk condensing milk.
(*g*) Cattle, sheep and pigs.
(*h*) Fowls, turkeys and eggs.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.). Johannesburg (a). Cape.	Lucerne (per 100 lb.). Johannesburg (a). Transvaal.	Lucerne (per 100 lb.). Cape Town 1st. grade.	Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.). F.o.r. Producers Stations. K1.	Kaffircorn in bags (200 lb.). F.o.r. Producers Stations. K2.	Dry Beans (200 lb.). bags. Johannesburg (a). Speckled Sugar.	Dry Beans (200 lb.). bags. Johannesburg (a). Cow Peas.	Dry Beans (200 lb.). bags. Johannesburg (a). Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	24 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2
February	5 2	3 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March	4 11	3 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6
April	5 3	4 6	7 2	3 9	17 9	17 7	71 6	38 9	44 0
May	6 4	3 9	7 3	4 4	18 0	18 6	71 8	37 11	54 5
June	6 9	5 6	—	4 11	16 10	16 10	96 1	42 0	78 10

(a) Municipal Market.
(b) Seasonal year for Kaffircorn 1st June–31st May; Dry Beans 1st April–31st March; Lucerne and Teff 1st July–30th June.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season (1st July to 30th June).	Johannesburg. Transvaal. No. 1.	Johannesburg. Transvaal. No. 2.	Johannesburg. N.M. Grade I. No. 2.	Johannesburg. N.M. Grade I. No. 3.	Durban. Natal. No. 1.	Durban. O.F.S. No. 1.	Pretoria. Transvaal. No. 1.	Cape Town. Cape. No. 1.	Cape Town. Cape. No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s.* d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939-40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940-41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941-42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	*20 1	17 3
1942-43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 6	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	18 1	14 10	11 6
April	23 1	21 11	30 2	30 4	29 9	25 11	28 4	30 2	24 0
May	27 10	26 7	30 7	29 6	29 4	22 10	30 0	28 10	26 3
June	29 8	27 8	—	—	30 0	29 11	—	29 8	28 4

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1st July to 30th June).	Eggs.			Fowls (Live, each).			Turkeys (Live, each).		
	Johannesburg, New Laid. Per Dozen.	Durban, New Laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42	1 6	1 9	10 7	3 5	3 4	3 7	12 10	10 2	14 4
1942-43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 8
1944—									
January	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11
February	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March	2 10	2 9	19 10	4 1	4 11	4 7	13 5	18 3	13 4
April	3 2	3 5	24 5	4 2	5 3	4 1	15 0	17 0	13 8
May	3 2	3 6	24 9	5 0	5 5	4 2	13 8	15 8	13 11
June	3 0	3 3	20 7	5 7	5 7	5 1	14 10	16 9	13 9

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

Season. (1st July to 30th June).	Onions (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johanburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939-40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941-42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942-43	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June	17 3	17 4	15 3	18 1	12 0	18 9	8 5	8 6	9 2
July	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
November	16 5	—	19 7	—	22 9	25 1	13 5	11 11	10 8
December	12 11	13 10	9 3	15 1	18 6	16 6	12 0	10 5	9 9
1944—									
January	11 3	10 9	8 8	12 3	9 6	11 7	14 1	9 4	11 10
February	12 7	14 0	7 10	11 7	12 9	13 9	15 8	10 10	11 6
March	14 4	14 10	11 1	15 0	13 5	15 1	12 11	8 6	10 10
April	16 6	16 11	13 7	17 0	14 0	18 2	12 6	8 8	9 8
May	17 2	19 10	15 6	19 7	20 3	21 7	12 3	13 5	9 6
June	26 1	21 11	18 8	23 2	22 2	22 11	16 3	14 9	11 1

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1st July to 30th June).	Cabages (Bag). (a)			Cauliflower (Bag). (a)			Tomatoes (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
193'	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
194	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
194	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2
February	7 5	7 8	22 2	6 8	—	—	4 7	1 9	2 9	2 3
March	13 4	10 6	25 7	10 4	8 11	15 6	6 8	3 3	2 5	2 5
April	11 3	10 11	22 8	9 1	8 5	12 2	5 11	2 10	3 1	2 4
May	11 11	7 10	18 0	10 5	8 2	13 10	5 6	2 10	3 8	2 5
June	12 2	8 9	12 0	11 10	10 2	11 11	4 10	2 6	4 0	1 8

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb., Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.).			Green Peas (Pockets 20 lb.).			Carrots (Bag). (a).		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940 41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942-43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	18 2
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	19 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 11	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11
December	2 1	0 6	2 5	3 8	1 5	5 10	8 6	7 0	7 7
1944—									
January	1 9	1 2	3 5	4 7	1 6	6 7	7 4	3 5	7 10
February	4 4	2 1	4 0	7 2	—	5 9	9 0	6 0	15 1
March	2 8	3 8	2 0	6 9	5 0	6 6	13 6	8 11	24 5
April	1 10	1 11	1 4	3 7	2 3	4 6	10 3	12 5	35 1
May	3 5	2 10	2 9	7 4	5 3	4 10	9 10	12 7	27 0
June	6 6	9 1	5 4	7 9	6 4	6 5	11 10	13 6	20 6

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb. Cape Town, 90 lb.: and Durban, 120 lb.

Prices of Avocado Pears and Pawpaws on Municipal Markets.

Season.	Avocado Pears (Per Tray). (*a*) Cape Town.	Durban.	Johannesburg. Ordinary.	Johannesburg. N.M.	Pawpaws. (*b*) Cape Town Std. Box.	Durban. Tray.	Johannesburg. Ordinary Std. Box.	Johannesburg. N.M. Std. Box.	Port Elizabeth Std. Box.	Bloemfontein Std. [illegible]
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 6	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	[illegible]
1939–40	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	[illegible]
1940–41	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	[illegible]
1941–42	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	[illegible]
1942–43	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	[illegible]
1943—										
January	4 3	—	3 9	6 4	2 8	1 8	2 0	3 9	3 1	1 8
February	2 3	—	2 8	5 8	2 6	1 9	3 6	4 11	6 4	2 6
March	2 1	1 1	2 7	3 7	2 11	1 9	3 9	5 2	4 10	2 11
April	2 3	0 10	2 6	3 9	4 2	1 10	3 3	4 4	6 0	3 6
May	2 5	1 5	2 5	3 9	3 11	1 6	2 11	4 1	3 3	2 9
June	2 9	1 5	2 9	4 8	3 0	1 9	2 9	3 9	3 11	2 5
July	3 6	2 4	3 3	4 2	2 11	1 8	2 4	3 2	3 0	2 9
August	4 8	3 2	4 6	5 5	2 9	1 6	2 1	3 4	2 10	2 4
September	5 0	3 7	5 9	6 7	3 1	1 9	2 4	3 3	3 5	3 0
October	5 2	2 9	5 6	5 11	3 9	1 3	2 5	3 0	3 1	3 0
November	7 1	3 10	4 11	4 3	3 5	1 2	1 11	2 8	3 8	2 [illegible]
December	4 8	4 6	4 5	4 9	2 11	1 2	2 3	3 3	3 6	2 [illegible]
1944—										
January	5 0	3 0	4 8	6 8	3 4	1 1	2 1	3 1	2 8	2 [illegible]
February	2 5	1 7	3 1	4 0	1 10	2 4	4 11	5 1	—	2 10
March	2 5	1 8	2 9	4 6	5 4	1 9	6 3	7 3	—	3 10
April	2 7	1 0	2 9	4 3	4 9	1 4	4 7	5 2	4 9	4 3
May	3 6	1 7	3 8	5 1	3 7	1 9	3 5	4 4	4 4	3 5
June	6 5	1 10	5 8	6 11	3 11	1 1	2 10	3 8	3 0	2 3

(*a*) Season 1st January to 31st December.
(*b*) Season 1st April to 31st March

Prices of Bananas and Pineapples on Municipal Markets.

Season.	Bananas (Per Crate) (*a*) Cape Town.	Johannesburg.	Pretoria.	Pine Apples. (*b*) Cape Town. Box.	Durban. Doz.	Johannesburg. Ordinary. Doz.	Johannesburg. Queen's Giant. Doz.	Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	22 5	9 10	16 5	5 4	3 3	1 1	—	3 5	1 2	4 10
1939–40	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940–41	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941–42	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942–43	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943—										
January	25 5	8 4	11 1	6 2	1 7	1 5	2 1	5 3	1 4	5 5
February	27 2	9 5	18 10	4 4	2 2	1 0	1 1	3 9	1 1	4 7
March	26 11	9 10	13 2	4 5	3 4	0 11	1 0	3 2	2 1	4 11
April	29 11	10 0	21 4	6 7	2 9	1 9	2 0	4 3	3 4	6 4
May	27 0	9 0	22 9	7 0	2 0	2 4	2 10	6 6	3 0	7 5
June	28 1	11 6	12 4	6 3	1 9	2 0	2 0	5 7	1 8	6 2
July	26 6	13 3	22 7	7 8	3 2	2 9	3 4	5 7	1 11	6 0
August	26 4	12 2	24 7	9 5	5 4	2 10	4 7	6 1	2 10	8 3
September	28 9	12 7	25 9	13 3	8 4	7 1	9 0	9 8	4 6	13 9
October	34 9	18 11	34 10	10 1	8 7	4 5	6 0	9 2	4 8	11 2
November	46 11	17 11	33 0	6 7	9 7	2 7	3 11	9 3	5 11	9 10
December	27 1	9 3	19 4	9 9	3 11	2 5	5 1	9 1	6 5	10 5
1944—										
January	32 4	12 0	—	8 3	1 8	1 7	3 4	8 8	2 3	6 1
February	28 6	9 0	20 6	4 9	1 8	1 0	1 0	4 4	2 3	4 5
March	38 8	16 1	17 3	7 8	2 9	1 6	1 4	3 9	3 9	5 5
April	46 11	16 7	22 10	6 9	4 3	2 4	—	5 1	1 11	7 0
May	35 1	11 2	21 0	7 9	5 11	2 10	1 11	7 1	2 1	7 7
June	34 5	9 9	13 9	10 0	3 1	3 6	3 1	6 8	2 9	11 6

(*a*) Season 1st January to 31st December.
(*b*) Season 1st October to 30th September.

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[*Photo: Division of Entomology.*]

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

Stud Services for Selected Mares, 1944-45.

STUD services for selected farmers' mares (donkey mares at Potchefstroom only) will again be available at the following colleges and stations.

Stud Station.	*Scheme A.*	*Scheme B.*
1. Grootfontein College, Middelburg, C.P.	Lakanal, O'Laet	Lancier, Offenbach.
2. Glen College, Glen, O.F.S.	Grootfontein Bayard	Reuben Amos; and the Thoroughbred, Boblo.
3. Elsenburg College, Stellenbosch, C.P.	Grootfontein Monsieur	Grootfontein Karel.
4. Cedara College, Cedara, Natal	C. Peter	C. Estane.
5. Potchefstroom College, Potchefstroom, Tvl.	Grootfontein Just; and the Donkey Jacks, Joe Louis and P. Knight	Glen Jan; and the Thoroughbred, Fast Castle. P. Tjaka (Jack).
6. Ermelo Research Station, Ermelo, Tvl.	—	Grootfontein Champion; and the Thoroughbreds, Kenilworth III and Vlakfontein.
7. Dohne Station, P.O. Dohne	Glen Jix	—
8. Pretoria University, Pretoria	Grootfontein Pontius	—
9. Oakdale School of Agriculture, P.O. Riversdale	Grootfontein Jasmine	—

Conditions of service are obtainable from the stud nearest to the applicant. In view of the experience of the past two seasons, farmers are requested to apply early, i.e. not later than 31 August (31 July for the Grootfontein College area), because applications exceed the existing accommodation at all the stud stations, and bookings cannot otherwise be properly regulated.

Subject to other conditions, mares will not be received after 25 December. Only mares of good type, 14·2 hands and over, in good condition and fully halter-tame, will be accepted. Mares not conforming to these requirements may be returned after inspection.

The season opens on 1 October 1944 and closes on 15 February 1945.

Sale of Blowfly Spray.

The Onderstepoort Blowfly Spray is now obtainable from Dealers and Co-operative Stores, at 4s. per gallon.

Farmers must provide clean and air-tight containers.

Dealers can obtain the blowfly spray from Onderstepoort or its substations at 3s. 6d. per gallon (in large drums).

Full particulars obtainable from the Director of Veterinary Services, Onderstepoort.

New Bulletins for the Farmer.

The following Bulletins have just been published and are obtainable from The Editor, Department of Agriculture and Forestry, Pretoria.

Bulletin No. 192.—"Control of Household Insects in S.A." (2nd Edition): Price 6d.

Bulletin No. 111.—"Dairy Farming" (Fifth Edition): Price 6d.

Bulletin No. 126—"Poultry Houses": Price 3d.

FARMING IN SOUTH ... AFRICA

Vol. 19 SEPTEMBER 1944 No. 222

Conserve Your Soil!

A plea for conservation farming in South Africa by Dr. H. H. Bennett, Chief of the Soil Conservation Service of the United States' Department of Agriculture, and the world's leading authority on soil conservation, who is at present visiting South Africa at the invitation of the Union Government in order to make a survey of erosion conditions in this country.

I HAVE come to South Africa primarily to study the problems of soil erosion and the methods of conserving soil and water which you are using to keep your farm lands permanently productive. Frankly, I am expecting to learn much that will help us in America to speed up our nation-wide programme of soil and water conservation and good land-use. If I can offer anything to your agriculturists in the way of advice from our American experiences that may be applicable here, I shall do my best to give you that information.

At this early stage there has not been the opportunity to study more than a few areas, and, accordingly, there is not a great deal to offer at the moment, further than to say that you have, at least locally, some grave problems of land depletion and outright ruin by erosion. These problems are being studied through a

Dr. Hugh H. Bennett.

type of research that is seeking their solution in the form of practicable methods of prevention of erosion and improvement of areas already damaged by erosion, over-cropping, and exhaustive grazing. Moreover, I have seen some excellent examples of practical improvement of damaged land and methods of using grazing areas, particularly with respect to rotational and seasonal grazing, stocking according to carrying capacity, and burning. Some of these findings, I am sure, can be profitably applied to some of our American conditions, and I intend to do what I can to present them to our farmers.

One thing which I am beginning to think, is that you, much as we in America, are not going nearly fast enough with actual work on the land. In the United States we finally have under way a far-reaching programme of soil conservation. We are now beginning to get extensive and outstandingly good results with our nation-wide efforts—much greater success than we dared hope for only a few years ago. We are also finding that conservation farming is easier, cheaper, and more remunerative than was our old way of wasteful farming. It is easier, for example, to plough across the slopes, on the contour, than to plough up and down the slopes, and more saving on the strength of both plough-animals and tractors. Contour farming takes less fuel for a machine and less time for operation. Yields per acre are higher with farming methods adjusted to the land according to the capability and needs of the land, based on the soil-slope-climate factors, as nearly as may be practicable.

Turning to the general aspects of erosion prevention and soil building, we must all, everywhere throughout the world, come to understand quickly that good farm land, in the final analysis, is the source of man's strength as well as the strength and life of vigorous nations. From productive land comes our food and fibre and wood supplies.

When the soil loses its capacity to produce, a farmer cannot remain on that land. He

retreats before the drive of erosion—as wind and rain strip off the topsoil. Whole civilizations have fallen before the attack of this aggressive enemy. And the tragedy is the greater because it need never have happened. Man brought it on himself by abusing the land. Much of the abuse came about unintentionally or unconsciously; but some of it—too much of it—was the result of carelessness and exploitation.

Man at first had little conception of the delicate soil balance maintained under a protective cover of vegetation. Only recently have we come to understand the full building and sustaining effect which vegetation has on land.

Rains falling on trees and grass do not strike the bare land to loosen soil particles. Instead, the tangle of plant-life catches and dissipates the beating, gouging effect of raindrops, and otherwise protects the soil and allows the ground to drink up and store the rainfall for crop use. And wind cannot blow away soil that is tied down by grass or other dense vegetative cover. Under natural conditions a good depth of rich topsoil is slowly developed. Plants live and die in the same place, and so contribute their decaying materials to the enrichment of the soil.

But man upsets this balance of Nature. With his axes and ploughs he clears away the protective cover and turns the soil upside down. His cattle graze the grass down to the very roots. Wherever agriculture has spread, the earth has been exposed to the erosive effect of rain and wind. On flat lands and steep lands, on both dry and wet areas, agriculture has paved the way for man-made erosion. Water, pouring down hillsides with nothing to obstruct its flow, tears away the topsoil, finally exposing the subsoil. And subsoil, as farmers everywhere know only too well, is not real soil. Often, with the topsoil gone, with slopes deeply dissected by gullying, farmers have to look for new land.

In South Africa, parts of the country are similar to parts of the United States. You,

too, know that one of the penalties for overgrazing is less forage on the veld and increasing erosion damage to the land. Erosion of the veld has been due, I am informed, chiefly to mismanagement of stock, just as we in the United States have worn-out grazing lands on our western ranches.

Erosion must and can be halted, both as a measure of farm efficiency and as the soundest kind of economic safeguard. Fortunately, the needs of man and the needs of Nature can be harmonized under a policy of wise land use. Erosion and security are completely incompatible. Through a sound programme of soil and water conservation, already tested and proved, we can check further damage to the world's limited supply of agricultural land, so that there may be more food for people everywhere.

In America, as in South Africa, we are just beginning to mend our ways in the use of land. It was only little more than a decade ago when, becoming conscious of the increasing damage we were inflicting on the land, we began to take positive action to halt destructive erosion. The government of the United States, like that of South Africa, came to regard soil erosion as a national problem—a national menace—and it initiated a programme of control.

In the United States, the Soil Erosion Service was formed in 1933. In 1935 this was reorganized as the Soil Conservation Service. To-day, I believe we can say that we have a vastly effective programme of soil and water conservation under way. We have already applied it to representative parts of the country—to more than 60 million acres—using measures developed to suit the various regional problems, physical and economic. To me, this seems one of the most fortunate instances of correct timing in our national history. A conservative estimate of our average increase in production is 20 per cent. Essential crops of grain, vegetables, potatoes, cotton and soyabeans are being produced at a rate at least one-fifth greater on conservation-

treated farms than on untreated farms. This figure is a minimum. Frequently, crop increases are much higher—40 per cent., 50 per cent., and more. In effect, therefore, conservation farming is the equivalent of finding new cropland. Every 5 farms where conservation has been completely installed are now producing the normal output of 6 untreated farms. The significance of this achievement can hardly be over-estimated.

A great many American farmers, having discovered how well soil conservation practices work, are applying them to their lands as fast as they can, and more and more of them are asking for assistance from the Soil Conservation Service. The methods vary with the land. Strip cropping, contouring, terracing, dam building, crop rotation, planting of steep slopes to protective vegetation, improvement in grazing methods, and many other methods and combinations of methods are being used.

Contour cultivation holds water on the land and then facilitates its absorption. Strip cropping cuts down both wind and water erosion. Cover crops, crop rotations, controlled grazing, terracing, and other soil conservation practices all help to increase production.

You in South Africa already know the importance of co-operating with Nature in bettering your veld problems. The Division of Soil and Veld Conservation of the Department of Agriculture in South Africa, like its sister organizations in the governments of the United States and other United Nations, is co-operating in the worthy job of trying to supply adequate food for the human family.

If any principle of conservation can be called universal, it is the saving of rainfall and the utilization of all available water on the land. In the United States, contouring is a simple and widespread practice for retaining moisture in the soil and preventing erosion. In South Africa you have found that grazing, so controlled that the

veld is not left bare, contributes to moisture preservation. Irrigation with water from reservoirs and streams and the flooding of lowlands with the run-off from neighbouring uplands are other ways of making use of available waters. Whatever the method, the objective is the same—to keep the land in good shape and condition, and to make practical use of available water.

It must not be understood from what I have said that we can revolutionize agriculture overnight. We soil conservationists understand that you cannot undo the errors of centuries with any magic wand or with mere advice or planning or passing resolutions. No, it is a tough job which calls for the co-operation of all—both farmers and people who live in cities, and it requires decisive action by individual farmers, communities, nations. The longer this vitally important undertaking is postponed, the more difficult it will be and the more expensive it will become.

Hugh H. Bennett

Short Courses in Beekeeping.

DURING 1945 the following three courses in apiculture will be given free of charge, viz:—

One course at Cape Town, January 16-19;
One at Stellenbosch, January 22-25; and
One at Pretoria, 2-5 April.

Applicants are requested to state which of these centres ~~will be~~ most convenient for them.

The course in Pretoria will be held in the Conference Hall and at the Departmental Apiary, Union Buildings; lectures will commence at 10 a.m. and demonstrations will stop at 4.30 p.m. in order to enable Johannesburg beekeepers to make use of the express trains each day.

The exact time and place of the lectures in the western Cape Province will be announced later.

Applications for the two courses in the Western Cape Province should reach the apiculturist, P.O. Box 513, Pretoria, before 15 December 1944, and for the course at Pretoria before 1 March 1945.

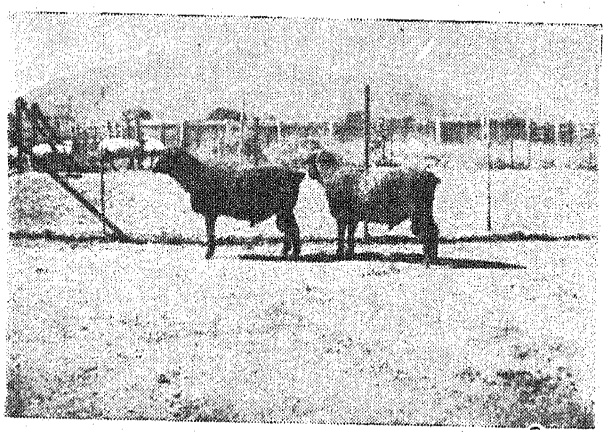
Railway concession forms will be obtainable for long journeys to each of these centres, where applicants will have to make their own arrangements for board and lodging.

Grade Southdown Sires for Sucker-lamb Production.*

J. S. Starke, Officer in Charge, Losperfontein Experiment Station.

In a previous article(1) it was shown that the purebred Southdown and Dorset Horn breeds were superior to the Ryeland as sires for sucker-lamb production, and that the Southdown produced a better lamb carcase than Dorset Horn.

Owing to the shortage of purebred rams of the mutton breeds and also to the high incidence of deaths among these, it was considered desirable to investigate the possibility of using grade Southdown sires for sucker-lamb production. Accordingly, a large-scale experiment was undertaken during 1941-42 at the Losperfontein Experiment Station. Conditions at Losperfontein, which is situated under the Hartebeestpoort Irrigation Scheme in the Brits district on the fringe of the Bushveld, were fully described in the article referred to above.



½-bred Southdown-Persian rams.

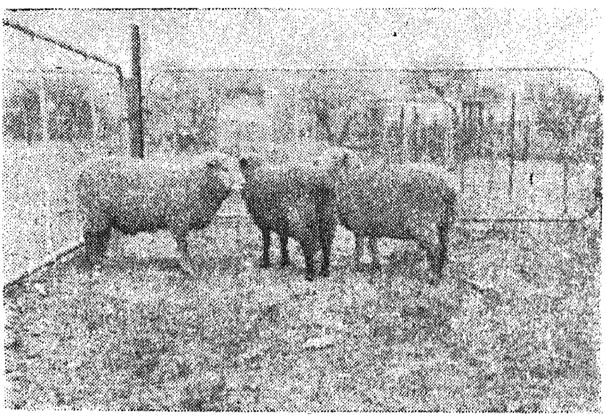
In the present experiment various Persian and Merino crossbred ewes were mated to rams of varying grades of Southdown on the Blackhead Persian base, viz., starting with ½-bred Southdown-Persian, increasing to the ¾-bred and ⅞-bred Southdown-Persian and finally the pure Southdown. The percentage blood of the Southdown breed in the four types of rams in the same order as mentioned above was thus 50 per cent., 75 per cent., 87½ per cent. and 100 per cent., whilst the Blackhead Persian percentage blood decreased correspondingly.

The mating period extended over 40 days from the beginning of November until mid-December. The ewes were brought in from the grazing shortly before sunset, drafted into their respective groups, and kraaled until sunrise. The rams were put with the ewes whilst they were in the kraals at night at the rate of three rams per flock of approximately eighty ewes. The rams were allowed to serve at liberty with as little interference as possible and with no assistance whatsoever, e.g., holding the large crossbred ewes to be mounted by

* In this article the term "sucker lamb" is used to denote lambs sold before weaning, whereas the term "fat lamb" indicates weaned lambs fattened for the market.

the short-legged rams. The ewes were disturbed as little as possible. Even so, it is possible that the driving of the ewes from the paddocks to the kraals and the drafting necessary for dividing into experimental groups may have had an effect on the ewes exhibiting oestrus. By running the rams with the ewes in the paddocks, a lambing percentage still greater than that actually obtained, is likely, due largely to a greater expectancy of twins.

As the ewes lambed, they were put on winter-cereal grazing in April and during the early part of May. When about a week old, the lambs started nibbling at the lush grazing, and when about four weeks old, were eating lustily. No supplementary feed was given to the ewes or lambs. Docking of the lambs' tails and castration of ram lambs were done at the age of 8 to 15 days. It was not found necessary to dose the lambs for internal worms. They were put through the foot-dip at weekly to fortnightly intervals, but were not given a full immersion dip.



$\frac{3}{4}$-bred Southdown-Persian rams.

The lambs were marketed off their dams as soon as they had passed the live weight of 60 lb.; this was done at weekly intervals from the end of June till the end of August.

Results.

Only the more practical aspects of the large amount of data collected will be considered in this article. Lamb production experiments can be divided into three definite phases: (1) conception, in which fertility and fecundity of the sire and dam, respectively, are the most important practical aspect, (2) growth, in which the post-natal growth period is of greater importance than the pre-natal period, and (3) the carcase as final product.

(1) Fertility.

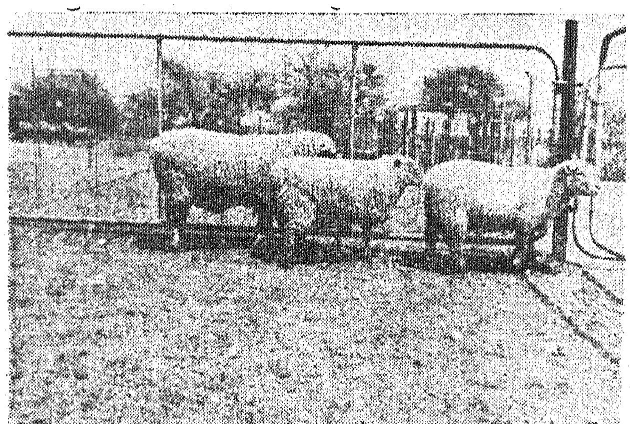
In Table 1 the number of different types of ewes which were mated to the different sires is tabulated, together with the resulting lambing data. The percentage pregnancy represents the number of ewes that were known to be pregnant, expressed as a percentage of the number of ewes present at the end of the mating season. Twinning and the losses at and before birth are expressed as a percentage of the number of ewes pregnant. The lambing percentage represents the number of lambs alive 6 hours after birth, expressed as a percentage of the total number of ewes present at the end of the mating season.

As different sires were used to serve the skips in the supplementary three-week mating period at the end of January for winter lambs, the winter lambing results are not included in the data under discussion.

TABLE 1.—*Lambing Data—Autumn*, 1942.

A.—Summary of Dams.	No. Ewes.	Percentage Ewes Pregnant.	Percentage Twins of Pregnancies.	Percentage Lost of Pregnancies.	Lambing Percentage.
Dorset-Persian	54	92·6	22·0	4·0	109·3
Suffolk-Persian	64	82·8	17·0	1·9	95·3
Dorset-Merino	77	49·4	34·2	13·2	59·7
Romney-Merino	92	59·8	18·2	7·3	66·3
TOTAL	287	68·3	21·9	6·1	79·1
B.—Summary of Sires.					
½-bred Southdown-Persian	69	69·6	25·0	6·2	82·6
¾-bred Southdown-Persian	72	70·8	25·5	11·8	80·5
⅞-bred Southdown-Persian	73	64·4	10·6	6·4	67·1
Purebred Southdown	73	68·5	26·0	0·0	86·3
TOTAL	287	68·3	21·9	6·1	79·1

The results contained in the summary of dams confirm the findings of the previous years (1) which were published in July 1942, in that:—



⅞-bred Southdown-Persian rams.

(1) The Dorset-Persian and Suffolk-Persian cross ewes were outstandingly more fertile that the Dorset-Merino and Romney-Merino crosses.

(2) Although the Dorset-Persian was more fertile and had a greater fecundity than the Suffolk-Persian ewes, the difference was not significant statistically; nor was the difference in fertility between the Dorset-Merino and Romney-Merino significant.

(3) The higher twinning percentage obtained from the Dorset-Merino and Dorset-Persian ewes is again noticeable, as well as the larger percentage of lambs lost from the Dorset-Merino dams.

A glance at the summary of lambing results from the different sires (Table 1 B.) shows that there is very little difference in the percentage pregnancy obtained in the ewes mated to the different sires. In fact, the greatest difference in pregnancy, viz., 6 per cent. between the ¾-bred and ⅞-bred Southdown groups, proved to be not significant statistically. The lambing percentages, however, show a greater divergence. The pure-bred sire group now shows the highest lambing percentage, i.e., 86 per cent., due to a higher twinning percentage and no death losses. The ewes sired by the ⅞-bred Southdown rams had the lowest lambing percentage, which is significantly less than that of the ewes bred to the purebred and halfbred Southdown rams; this is due to the slightly lower percentage pregnancy and significantly fewer twins than in the other groups. From a general survey of the data, however, it would appear that there is no marked difference in fertility between the various grades of Southdown rams.

An intersting sidelight closely associated with the fertility of rams is revealed in the results of the rectal temperatures recorded for the different types of rams. Individual rectal temperatures were taken daily in the afternoon, at about 5.30, before the rams were allowed with the ewes and again after they had been taken out in the early morning at 6.30. The means of temperatures recorded for the individual rams during the mating period of 6 weeks are given in Table 2.

TABLE 2.—*Mean Body Temperatures of Individual Rams, 4.11.41 to 13.12.41.*

Type and Number of Ram.	Morning.		Evening.	
	Mean.	Range.	Mean.	Range.
½-BRED SOUTHDOWN-PERSIAN.	°F	°F	°F	°F
S.P. 36	101·7	101·0–102·6	103·8	102·6–104·6
S.P. 43	101·8	101·0–102·8	103·8	102·8–104·8
S.P. 172	101·8	101·0–102·8	104·1	103·0–105·0
S.P. 175	101·9	101·0–102·8	104·1	103·0–105·2
Mean	101·8	101·0–102·8	103·9	102·6–105·2
¾-BRED SOUTHDOWN-PERSIAN.				
S.S.P. 1	101·8	101·0–103·0	104·1	102·8–105·0
S.S.P. 48	101·8	101·2–102·8	103·8	102·8–104·8
S.S.P. 57	101·8	101·0–102·8	104·0	102·8–105·0
Mean	101·8	101·0–103·0	104·0	102·8–105·0
⅞-BRED SOUTHDOWN-PERSIAN.				
S.P. 2	102·3	101·4–103·8	104·4	103·2–105·4
S.P. 3	101·8	101·0–102·2	103·9	102·8–104·8
S.P. 4	102·0	101·0–104·0	104·1	103·0–105·2
Mean	102·0	101·0–104·0	104·1	102·8–105·4
PUREBRED SOUTHDOWN.				
111	102·0	101·2–103·0	104·1	103·0–105·4
153	101·9	101·0–103·0	103·9	103·0–105·0
202	101·8	101·0–102·4	103·9	103·0–105·2
233	101·8	101·0–103·0	103·9	102·8–105·0
237	101·8	101·2–102·2	103·9	102·8–105·2
Mean	101·8	101·0–103·0	104·0	102·8–105·4
Mean of all	101·9	101·0–104·0	104·0	102·6–105·4

From the above table it is obvious that there is no difference in the rectal temperatures of the various grade Southdown rams. The mean evening temperature of 104° F. (5.30 p.m.) is considerably higher than the mean morning temperature of 101·9° F. (6.30 a.m.). There was also quite a wide range in temperature, viz., 101·0-104·0° F. in the morning and 102·6-105·4° F. in the evening. None of the rams showed any noticeable indisposition during the mating period.

During the months of November and December the air temperatures recorded in a Stephenson screen at the Experiment Station were as follows:—

Month.	*Mean Max.*	*Range.*	*Mean Min.*	*Range.*
November....................	92·9°F	80–104°F	63·6°F	60–78°F
December.....................	88·5°F	72– 99°F	65·4°F	54–75°F

It is thus seen that the purebred or high grade Southdown rams were not affected by the high local temperatures any more than the halfbred Southdown-Persian rams in so far as body temperature and its effect on fertility are concerned.

(2) Growth.

In the previous study (1) the twin lambs were eliminated from the results, but as twinning is considered an essential part of sucker-lamb production under irrigation, all lambs are included in the following analysis, except those that died before they reached slaughter weight or weaning. Even those few lambs that had not reached the slaughter weight by the time they were weaned at 3½ to 4 months, are included in the data given in Table 3, which gives the mean growth data of the different second cross lambs from the various crossbred dams, as well as a summary of the lambs from the different grades of Southdown sires.

-*Mean Growth Data of Sucker Lambs* (1942).

Dam.	Sire.	No. Lambs.	No. Twins.	Birth Weight (lb.).	Final Weight (lb.).	Age (Days).	Daily Gain (lb.).
Dorset-Persian.......	½ Sd–P	13	6	8·20	62·81	98·8	0·567
	¾ Sd–P	15	4	9·01	62·50	93·3	0·581
	⅞ Sd–P	16	4	8·64	62·53	93·8	0·586
	Pure Sd	14	5	8·70	62·50	97·8	0·571
TOTAL........	—	58	19	8·65	62·58	95·8	0·577
Suffolk-Persian......	½ Sd–P	16	4	7·44	61·59	101·5	0·543
	¾ Sd–P	16	8	7·64	62·28	97·4	0·572
	⅞ Sd–P	13	—	8·63	62·96	96·8	0·572
	Pure Sd.	14	4	8·96	62·50	96·4	0·574
TOTAL........	—	59	16	8·12	62·30	98·1	0·565
Dorset-Merino.......	½ Sd–P	10	2	8·20	62·65	96·1	0·581
	¾ Sd–P	10	6	6·59	61·50	118·0	0·471
	⅞ Sd–P	5	2	7·70	62·90	118·6	0·474
	Pure Sd	18	8	8·18	61·89	98·2	0·562
TOTAL........	—	43	18	7·76	62·09	104·7	0·535
Romney-Merino.....	½ Sd–P	13	2	7·45	61·77	106·5	0·523
	¾ Sd–P	15	2	7·30	61·67	109·6	0·509
	⅞ Sd–P	14	—	7·99	61·53	100·9	0·541
	Pure Sd.	14	4	8·16	60·39	110·6	0·484
TOTAL........	—	56	8	7·72	61·34	106·9	0·514

SUMMARY OF SIRES.

½-bred Southdown-Persian......	52	14	7·78	62·14	101·0	0·552
¾-bred Southdown-Persian......	56	20	7·73	62·04	103·3	0·540
⅞-bred Southdown-Persian......	48	6	8·35	62·40	99·3	0·557
Purebred Southdown...........	60	21	8·48	61·83	100·6	0·549
GRAND TOTAL........	216	61	8·09	62·08	101·1	0·549

From the summary at the foot of Table 3 it will be seen that the lambs from the different sires reached an average live weight of 62 lb. in about 100 days, with no appreciable difference between the different groups. The lambs reared by Dorset-Persian crossbred dams reached this weight in 96 days (and the Suffolk-Persian group in 98 days), whilst the lambs from Dorset-Merino and Romney-Merino groups took 105 and 107 days, respectively, to reach 62 lb. This again demonstrates the excellence as a mother-ewe for lamb production of the Dorset-Persian crossbred in particular, and of the Persian cross ewe in general, in comparison with the Merino cross.

Bonsma(2) obtained similar results at the Pretoria University. He showed that although there was no appreciable difference in the milk production of the Dorset-Persian and Dorset-Merino mother-ewe, the lambs from the Dorset-Persian dams grew faster than the lambs from the Dorset-Merino crossbred ewes. It would thus appear that the lamb from the Persian crossbred ewe is able to utilize the available nutrients better for conversion into flesh than the lamb from the Merino crossbred ewe.

(a) *Birth weight of Lambs.*—An analysis of the birth weights of the lambs revealed that the male lambs were 8 per cent. heavier than the female lambs and that single lambs were 20 per cent. heavier than twin lambs, e.g.:—

Type of Lamb.	Number.	Mean Birth Weight (lb.).
Males..	66	8·94
Females..	82	8·21
Twins..	79	7·15

These differences were statistically significant at 1 per cent. level, i.e., $P < \cdot 01$, which means that the probability is less than one in a hundred that this result was due to chance.

In the following table the birth weights of all the lambs from the different sires are summarized.

Sire.	No. Lambs.	No. Twins.	Mean Birth Weight (lb.).
½-bred Southdown-Persian..........................	57	22	7·71
¾-bred Southdown-Persian..........................	57	22	7·77
⅞-bred Southdown-Persian..........................	50	9	8·27
Purebred Southdown................................	63	26	8·44

The lambs from the purebred Southdown sire were significantly heavier ($P < \cdot 01$ per cent.) than those from the half and three-quarter

bred sires. The seven-eighths bred sire also produced a somewhat heavier lamb at birth than the ½- and ¾-bred sires; the same value, however, cannot be attached to this difference, as the ⅞-bred Southdown sired considerably fewer twins than the other groups.

A comparison of the birth weights of the lambs from the different dams in the summary below reveals that the Dorset-Persian crossbred ewes gave birth to heavier lambs than the other crossbred ewes ($P < \cdot 01$), whilst there was no significant difference between the Suffolk-Persian, Dorset-Merino or Romney-Merino ewes in so far as the birth weights of their lambs are concerned. By the use of proper statistical methods of analysis due allowance has been made for the varying number of twins and of both sexes in single lambs in the data under discussion.

Dam.	No. Lambs.	No. Twins.	Mean Birth Weight (lb.).
Dorset-Persian	59	20	8·63
Suffolk-Persian	62	19	8·08
Dorset-Merino	46	24	7·69
Romney-Merino	60	16	7·73

(*b*) *Rate of Growth.*—The rate of growth of the lambs was measured by the daily gain, which was obtained by dividing the number of days required to reach the final weight into the difference between final weight and birth weight. There was no difference in the daily gains made by male and female lambs, but the single lambs had a 20 per cent. greater rate of growth than the twin lamb ($P < \cdot 01$).

Type of Lamb.	Number.	Mean Daily Gain (lb.).
Males	67	0·585
Females	87	0·569
Twins	64	0·481

In the above growth analysis one of twins reared singly by its own dam was regarded as a single lamb, whilst lambs not reared by their own dams were excluded. All twins born alive were included in the birth-weight analysis, whereas in the growth analysis only the lambs reared as twins by their dams were included in the data.

Sire.	No. Lambs.	No. Twins.	Mean Daily Gain (lb.).
½-bred Southdown	52	14	0·552
¾-bred Southdown	56	20	0·540
⅞-bred Southdown	50	8	0·554
Purebred Southdown	60	22	0·549

TABLE 4.—*Mean Carcase Data of Sucker Lambs* (1942).

Table 4 gives the mean carcase data of the various second-cross lambs from the different sires on the various crossbred dams with a summary of the sire groups as the bottom of the table.

Dam.	Sire.	No. Lambs.	No. Twins.	Warm Carcase Weight (lb.).	Dressing Per cent.	GRADES. A Per cent.	GRADES. B Per cent.	GRADES. C Per cent.	Conformation 0–10.	Finish 0–10.	Evenness 0–10.
Dorset-Persian	½ Sd–P	13	6	32·4	51·6	·8	92	6·6	—	7·9	6·8
	¾ Sd–P	15	4	33·5	53·5	53	47	7·5	—	8·1	7·3
	⅞ Sd–P	16	4	33·3	53·2	81	19	7·5	—	8·4	7·4
	Pure Sd	12	5	32·9	52·2	75	25	7·7	—	7·8	7·7
TOTAL	—	56	19	33·05	52·70	55·4	44·6	7·34	—	8·11	7·30
Suffolk-Persian	½ Sd–P	15	4	32·2	52·0	20	73	6·6	7	8·0	6·7
	¾ Sd–P	16	8	33·0	53·0	44	56	7·4	—	7·7	7·3
	⅞ Sd–P	13	—	33·6	53·2	77	23	7·4	—	8·6	7·3
	Pure Sd	14	4	33·0	52·8	71	29	7·4	—	8·1	8·0
TOTAL	—	58	16	32·92	52·72	51·7	46·6	7·19	1·7	8·10	7·33
Dorset-Merino	½ Sd–P	10	2	31·2	49·9	30	50	6·5	20	7·2	7·5
	¾ Sd–P	10	6	30·3	49·3	60	20	7·2	20	7·2	7·8
	⅞ Sd–P	5	2	30·2	48·0	20	80	6·8	—	7·4	8·0
	Pure Sd	18	8	30·0	48·5	39	44	7·2	17	7·0	8·2
TOTAL	—	43	18	30·39	48·93	39·5	44·2	6·98	16·3	7·14	7·91
Romney-Merino	½ Sd–P	13	2	30·4	49·1	31	46	6·5	23	7·5	7·7
	¾ Sd–P	15	2	31·1	50·3	60	27	7·5	13	7·4	8·1
	⅞ Sd–P	14	—	30·6	49·7	57	29	7·1	14	7·9	8·4
	Pure Sd	12	4	28·8	46·7	25	42	6·6	33	6·8	8·2
TOTAL	—	54	8	30·28	49·06	44·4	35·2	6·93	20·4	7·43	8·09
SUMMARY OF SIRES.											
½ bred Southdown-Persian		51	14	31·59	50·72	21·6	66·7	6·55	11·7	7·71	7·16
¾-bred Southdown-Persian		56	20	32·14	51·76	53·6	39·3	7·43	7·1	7·68	7·61
⅞-bred Southdown-Persian		48	6	32·27	51·65	66·7	29·2	7·27	4·2	8·21	7·71
Purebred Southdown		56	21	31·11	49·96	51·8	35·7	7·21	12·5	7·43	8·04
TOTAL		211	61	31·76	51·01	48·3	42·7	7·12	9·0	7·74	7·64

The daily gain of the lambs, grouped according to the type of dam, is given below:—

Dam.	No. Lambs.	No. Twins.	Mean Daily Gain (lb.).
Dorset-Persian	58	20	0·577
Suffolk-Persian	60	17	0·563
Dorset-Merino	43	18	0·535
Romney-Merino	57	9	0·513

The summary of the daily gain of the lambs, grouped according to sire, indicates that there is no significant difference in the rate of growth of the lambs sired by the various grades of Southdown rams .

The lambs from Dorset-Persian mothers grew significantly faster ($P < \cdot 01$) than the lambs from the Dorset- and Romney-Merino dams, but the slight superiority over the Suffolk-Persian ewes was not significant.

The lambs from Romney-Merino ewes had a slower rate of growth than the lambs reared by the Persian crossbred ewes ($P < \cdot 01$); and, if due allowance is made for the few twins included in the Romney-Merino group, the lambs from the Dorset-Merino ewes also grew significantly faster ($P < \cdot 05$) than the former.

(*a*) *Dressing Percentage.*—Since the lambs were slaughtered as nearly as possible at a constant live weight, any differences in carcase weights would be due to a difference in dressing percentage. There is, however, no significant difference in carcase weights nor in the dressing percentages of the lambs sired by the different grades of Southdown rams, as can be seen in the summary of the sire groups in Table 4.

(*b*) *Grading.*—The grading figures show that the ½-bred Southdown-Persian sire had significantly fewer lambs in grade A than the other three grades of Southdown sires. The ⅞-bred Southdown-Persian had the highest percentage of A-grade lambs, but statistically this figure was not significantly greater than that for the ¾-bred or purebred Southdown sires.

Although the lambs from Persian-cross dams showed a better grading result than those from the Merino-cross ewes, the numbers were not large enough to establish any significant difference.

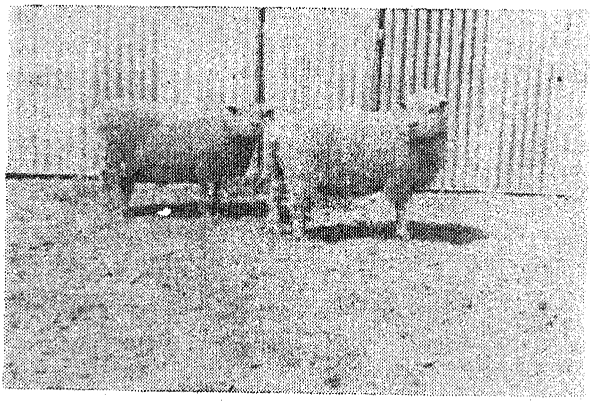
The standard of grading adopted was that in use for the export of lamb before the war.

In addition to being graded, the carcases were also adjudicated by at least two competent judges and assigned a value out of 10 for conformation, finish and evenness of finish, respectively. The means for the various crosses are indicated in Table 4.

(*c*) *General Conformation.*—The ½-bred Southdown-sire group of lambs had a poorer conformation (value of 6·6) than the ¾-bred, ⅞-bred or pure Southdown-sired lambs (values of 7·4, 7·3 and 7·2, respectively). (Significance of $P. < \cdot 01$). There was no difference in the conformation of the lambs from the latter three types of sires. The relatively low value scored by the Southdown group of lambs is largely due to the poorer average conformation of the Southdown × Romney-Merino lambs (see Table 4).

The lambs from Persian crossbred dams had a better conformation than the lambs from Merino crossbred dams; the difference

between the Suffolk-Persian and Dorset-Merino groups of lambs was, however, not sufficient to establish a significant difference.



Purebred Southdown rams.

Single lambs had a significantly better conformation than twin lambs (P<·01), but amongst the single lambs the difference between female and male lambs was not significant.

Type.	No. Lambs.	Mean Conformation Value.
Male	61	7·15
Female	80	7·29
Twins	63	6·92

(c) *Finish.*—The single lambs also had a better finish than the twin lambs (P<·01); the difference between the female and male lambs was not significant.

Type.	No. Lambs.	Mean Finish Value.
Male	61	7·77
Female	80	8·02
Twins	63	7·36

In comparing the sires in Table 4 it is seen that the lambs from the ⅞-bred Southdown × Persian ram had significantly better finish than the lambs of the other sire groups. A closer study shows that within each group of ewes the ⅞-bred Southdown consistently sired lambs of better finish than the other rams. The difference is rather accentuated by the fewer twins sired by the ⅞ Southdown, but even when due allowance is made for this factor, the difference in finish in favour of the ⅞ Southdown is still significant, although not so marked. The reason for the superiority of the ⅞ Southdown in this respect is not quite clear. Possibly it may be due to the small percentage of Persian blood with that of the Southdown. The Southdown sire is noted for its ability to produce a finished lamb at a

relatively light weight. In the $\frac{7}{8}$ Southdown sire this ability is most likely largely retained and, in addition, we have a slight infusion of the highly developed fattening propensity of the Persian.

In judging the carcases for finish it was considered that the value of 8 indicated the most desirable finish, and values between 7 and 8 as still desirable. Thus the lambs from the $\frac{7}{8}$-bred Southdown sire must be considered to be slightly overfat on the average. It must be borne in mind, however, that the lambs were reared under very favourable conditions at Losperfontein and so this tendency should not cause any misgiving.

The Southdown-sired lambs had the lowest value for finish, although in comparison with the half- and three-quarter bred Southdowns the difference is not significant. The lower average finish of the lambs sired by the Southdown is largely due to the relatively poor finish scored by the Southdown × Dorset-Merino and Southdown × Romney-Merino lambs. (See Table 4.) Of all the different crosses of lambs the two last mentioned crosses had the lowest finish, viz., that of 7 and lower; they are also the only two with no Blackhead-Persian blood. It would thus appear that the inclusion of some Blackhead Persian blood in the fat-lamb would be desirable under South African conditions for the production of a well-finished carcase.

A comparison of the lambs from the different dams shows that the Persian-cross dam groups had a much better finish than the Merino-cross dam groups. The better finish of the lambs from the Persian-cross ewes appears to be due to the ability of these lambs to utilize their feed to better advantage than the lambs from the Merino-crossbred ewes, as well as to a greater infusion of the Blackhead Persian blood with its remarkable fattening propensities.

(*d*) *Evenness of Finish.*—In determining the score for evenness of finish, a value of 10 was regarded as the most desirable. This however, can be considered as a theoretical optimum seldom obtained, whilst a value of 8 to 9 would indicate a very desirable fat distribution as obtained in practice. When comparing the lambs from the different dams for evenness of finish, it is evident that the lambs from Merino cross dams had a much more even distribution of fat than those from Persian cross ewes.

Of the various sire groups, the lambs sired by the halfbred Southdown had a poor distribution of fat, the difference in score for evenness of fat distribution being significantly lower ($P < \cdot 01$) than that of the other sire groups. The Southdown-sired lambs showed a desirable distribution of fat which was significantly better than that of the lambs from the other sires ($P < \cdot 05$). In comparing the individual breeds in Table 4 it will be seen that the $\frac{1}{2}$-bred Southdown-Persian × Dorset-Persian and × Suffolk-Persian lambs had the poorest distribution of fat. This can be expected as the progeny had 50 per cent. Persian blood. The mating of $\frac{1}{2}$-bred Persian crosses for sucker-lamb production is thus most undesirable as far as the fat distribution over the carcase is concerned. Although the $\frac{3}{4}$-bred and $\frac{7}{8}$-bred Southdown sires produced lambs whose carcases had a significantly poorer fat distribution than those sired by the Southdown, the former nevertheless had a fair fat distribution; and if the progeny from these grade sires on the Merino-cross ewes only are considered, it will be seen that the fat distribution of their carcases was practically as good as that of the lambs sired by the Southdown. (See Table 4).

No difference in the evenness of fat distribution between male and female lambs or between single and twin lambs was observed.

Summary and Conclusions.

In comparing the various grades of Southdown sires it has been shown that:—

(1) There was no marked difference in fertility between the ½-bred, ¾-bred, ⅞-bred and purebred Southdown.

(2) There was no significant difference in rectal temperatures.

(3) The purebred Southdown sired lambs heavier at birth than the ½-bred and ¾-bred Southdowns.

(4) There was, however, no significant difference in the subsequent growth of the lambs sired by the different grade rams.

(5) The carcases of the lambs from the halfbred Southdown sire were of a lower grade than those from the other sires, due to a poorer conformation and poorer distribution of fat over the body. There was no significant difference in the grading figures of the lambs from the ¾-bred, ⅞-bred and purebred sires.

The following additional points were established:—

(6) The Persian crossbred ewe again showed its superiority over the Merino crossbred as a mother-ewe for sucker-lamb production. (The wool factor has not been taken into consideration.)

(7) The Dorset-Persian cross ewe was only slightly superior to the Suffolk-Persian.

(8) Single lambs were on the average 20 per cent. heavier at birth than twin lambs, and also grew 20 per cent. faster; in addition, they produced a carcase of better conformation and better finish and graded higher.

From this trial it can be concluded that where purebred Southdown rams are not available, ¾-grade and ⅞-grade Southdown-Persian rams can be used on crossbred ewes for sucker-lamb production with excellent results. It must be borne in mind, however, that in sucker-lamb production all the resultant progeny are marketed, and so the use of grade sires can be recommended.

The use of a halfbred sire, such as the Southdown-Persian halfbred, is absolutely undesirable for sucker-lamb production.

It would appear that a certain amount of Blackhead Persian blood is very desirable in the sucker lamb. Where the mother-ewe is a Merino cross, the use of a high grade Southdown-Persian ram would even be preferable to a purebred Southdown; in the case of the Persian crossbred mother-ewe a purebred Southdown ram is most likely to give the best results.

Acknowledgements.

Dr. H. W. Turpin and Mr. G. S. Maré of the Division of Animal and Crop Production are to be thanked for their guidance and interest in the work conducted at Losperfontein.

The care and management of the sheep at Losperfontein was in the capable hands of Mr. F. A. le Grange.

The slaughtering of the lambs was done at the Onderstepoort Meat Laboratory; the authorities are thanked for their willing co-operation in placing the necessary facilities at our disposal. The judging of the carcases was done mostly by Dr. G. N. Murray and Mr. R. Hirzel, whose great assistance is much appreciated.

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Hints on Seed-Potatoes.

W. van der Merwe, Field Husbandry Research Officer,
Vaalhartz Experiment Station.

ONE of the most important factors determining the production of a profitable crop of potatoes is the quality of the seed. Even though cultivation, fertilizing and other conditions may be ideal, maximum yields cannot be expected unless the seed-potatoes are of the best quality.

What is Understood by "Good Seed-potatoes"?

1. Good seed-potatoes must, as far as possible, be free from disease—not only visible but also virus diseases. These virus diseases, which are not visible in the tubers, are primarily responsible for the rapid deterioration of imported seed-potatoes after a few years' cultivation in the Union. In most parts of our country climatic conditions favour the spread of virus diseases. Owing to the danger of hidden degenerative diseases in any tuber, it is recommended that only tubers from strong, healthy plants be used as seed-potatoes. If this is impracticable, it is better to plant seed-potatoes of more than 3 ounces, for the chances are much better that a large tuber comes from a healthy, vigorous plant than from a sickly, weak one.

2. Good seed-potatoes must be firm and have shoots just beginning to sprout; if the shoots have already developed they must be short and thick.

Problems in Various Areas.

In spite of the fact that potato-growers may take all precautionary measures to ensure the quality and vigour of their seed-potatoes by careful selection of the plants on the land and by strict inspection of the tubers afterwards, or alternately, by purchasing Government-certified seed-potatoes, one finds that the matter does not end there. Often seed-potatoes are planted which, although they generally comply with the above requirements, still leave much to be desired in other respects. The result is that yields are low and uneconomic.

In accordance with climatic and moisture conditions in the various parts of the country, the planting season for potatoes varies considerably. In most of the potato-producing areas of the Union only one crop per year is raised, but even here the planting season varies. So, for instance, there are areas in the Transvaal, Orange Free State and Natal where potatoes are planted chiefly in September/October, so that the main crop matures in January/February, when the temperature is still high and conditions are of such a nature that it is practically impossible to keep the seed-potatoes over in a fresh and firm condition until the following planting season. By this time the tubers will be old and shrunken, with shoots which will have had to be removed once or twice. Apart from the possibility that degenerative diseases may be present in such old seed-potatoes, maximum yields cannot be expected as a result of a change alone. It is a fact that seed-potatoes from which the shoots have been broken off before planting will not only sprout later, but will also produce more and therefore weaker stems than freshly sprouted tubers. The plants also mature earlier, with the result that the yield is poor.

In the low-veld areas, which are free from frost, potatoes cannot be cultivated during the summer heat. They are therefore

planted during winter and the crop is lifted from September to November, so that even in those areas it is not possible to keep seed-potatoes in good condition throughout the summer months for the next planting season.

Keeping Seed-potatoes Fresh.

In order to eliminate the harmful effect which the raising of only one potato crop per year has on the quality of seed-potatoes, viz. ageing, potato-farmers must do all in their power to keep their tubers fresh as long as possible. The highveld farmer must aim at planting that part of his crop which must serve as seed-potatoes for the following year as late as possible, even though the danger of blight (*Alternaria*) and therefore poorer yields may be greater. If this is done the potatoes will ripen under favourable climatic conditions and the storage period will be shorter and cooler than that to which the normal crop is subjected in these areas. In addition, care must be taken that storage conditions are correct. Storage in large heaps or in bags must be avoided. It is better to spread seed-potatoes out on trays in a cool, well-ventilated store, or otherwise to keep them in crates. The aim must be to keep the temperature as low as possible.

Greening of Seed-potatoes.

It is advisable that seed-potatoes undergo greening by exposing them to indirect light. Greening will cause seed-potatoes to develop a tougher skin and also to keep better. The sprouts will be short, thick and sturdy and not break off easily. Where the potato moth is active, care must be taken that the tubers are not attacked by this pest. In spite of the above-mentioned precautionary measures it is often in the interest of producers, especially on the highveld, to obtain seed-potatoes from elsewhere, namely, Government-certified seed-potatoes which are offered by seed-potato growers' associations, and which, as a result of earlier or later planting, or as a result of the practicability of two crops per year, are still fresh and young. Seed-potatoes from some of the irrigation areas will, as far as this is concerned, meet the needs of both the highveld and the lowveld. Seed-potatoes from the August/September plantings will, for instance, be ready for planting in the lowveld from April, whilst the autumn crop, which is planted during January to the middle of February and lifted during the winter months, will be ready for planting in spring on the highveld. In certain areas, as e.g. at the Vaalhartz and Riet River settlements, the usual procedure is to plant the first crop in August/September, so that it matures towards the end of November and the first half of December. From this crop, seed-potatoes are again planted during January/February for the autumn crop, in order to provide tubers for the spring plantings.

Rest Period for Seed-potatoes.

Although in the real sense of the word seed-potatoes are not seeds, potatoes which are required for planting purposes must also undergo a period of rest, as is usually the case with seeds. In the case of potatoes the rest period normally lasts from 4 to 12 weeks, according to the variety and the temperature during storage. The Up-to-Date variety, which is the most important in the Union, is especially slow in this respect and attempts are sometimes made to force seed-potatoes to sprout in order to have them ready for certain planting times. So, for instance, special steps must be taken at the Vaalhartz and Riet River settlements to get the crop

which is lifted from November to the middle of December, ready for planting from January to the middle of February.

Poor yields are usually obtained when seed-potatoes which show no or few signs of growth are planted, but owing to the short autumn season planting cannot be postponed too long either. Farmers who plant fresh or unsprouted seed-potatoes usually obtain poor stands and therefore poor yields.

During the planting season the prevailing soil temperature is high and only seed-potatoes which will grow immediately stand the least danger of rotting. Such seed-potatoes will give rise to strong plants which can make the most use of the available soil moisture and will thus be well developed before the early frost. Rotting of the tuber during the early growing stages of the plant causes loss of vigour. It has been established experimentally that the plant can derive strength and nourishment from the seed up to the time it reaches the flowering stage. If the mother-tuber is removed or rots before that time, the plant suffers.

How to Obtain Two Crops per Year.

For the above-mentioned areas the production of a profitable second potato crop thus depends on a good and uniform stand, followed by uninterrupted development and maturing of the crop. To ensure this, two ways are open:—

(1) Certified seed-potatoes must be bought from areas in which the lifting season is such that the tubers are still fresh by January, but have already undergone the rest period. Seed-potatoes which have begun to sprout will immediately begin growing after planting.

(2) The necessary steps must be taken to ensure that tubers from the first crop are suitably sprouted before planting. In order to lengthen the period between lifting and the second planting and so obtain the necessary rest period, part of the spring crop can be planted earlier than usual, even though it runs the risk of being damaged by untimely frost. Such potatoes, which ripen a few weeks before the rest of the crop, may serve exclusively as seed-potatoes for the autumn crop.

To Promote the Sprouting of Seed-potatoes.

As soon as the potatoes have been lifted, they must be stored in a suitable spot where they will not be exposed to direct sunlight, but where a moderate temperature can be maintained as uniformly as possible. If the temperature rises too high, rotting will ensue; if it is too low, sprouting will be retarded. A storage temperature of 70-80° F. appears to be the best. It has been established that potatoes stored at such a temperature will germinate more quickly and more uniformly than those stored at a temperature lower than 50° F. or higher than 90° F. The maintainance of humid air conditions also helps to promote sprouting.

Storage under dry air conditions will cause the seed-potatoes to shrink and be less firm—a condition which retards the sprouting process. Seed-potatoes can, e.g., be packed in a layer in fine straw kept moist by regular wetting. Here, however, care must be taken that the layer of potatoes is not too thick or packed too tightly. As potato tubers are living parts of plants and as such also give off heat, the heaps must be inspected regularly to see that the temperature does not rise too quickly, for such conditions may cause rotting. Another precautionary measure is to see that all surplus water drains off from the heap. The seed-potatoes themselves must not be wet. The right moisture conditions must be maintained during the whole storage period.

Stimulants for Sprouting.

Considerable attention has already been devoted to the treatment of fresh potatoes with chemicals in order to force new growth. Some research workers have obtained favourable results, but in practice the application of such treatments was not always possible.

Under certain conditions acetylene gas gave good results. Into a tank or other container with a capacity of more or less 24 gallons, pour 16 to 17 gallons of water and add ¾ lb. calcium carbide piece by piece so that the acetylene gas generated may slowly bubble through the water and so dissolve. If the process takes about 15 minutes the water in the container will be saturated with the gas. Then place a bag of uncut seed-potatoes in the solution and leave it there for 4 to 5 hours. After removal, the seed-potatoes must immediately be planted in moist soil. If the soil is not right the treated potatoes can be kept between wet bags for as long as a week. A cool spot in the shade must be chosen for this work.

(N.B.—Remember that acetylene gas is highly inflammable.)

Cutting Seed-potatoes.

Observations made at the Vaalhartz experiment station show very clearly that it is advantageous to cut seed-potatoes for the autumn crop, as can be seen from the following table.

Table indicating the percentage of sprouting plants.

Treatment.	Size of Seed-potato.	Percentage sprouted plants after—				
		3 weeks.	4 weeks.	5 weeks.	6 weeks.	12 weeks (Final stand).
		%	%	%	%	%
1	2-oz. uncut..........	0·0	1·0	1·9	2·9	84·7
2	4-oz. whole..........	0·0	0·0	1·9	2·9	85·7
3	4-oz. cut in 2-oz. pieces	1·0	27·9	45·2	65·5	81·8

The potatoes used were from tubers planted towards the middle of September 1943 and lifted on 22/12/43. Potatoes from this crop were kept in open trays in an ordinary store under a layer of straw. At the time of planting (28/1/44) they were still very fresh and no signs of sprouting were to be noticed. For treatment (3) 4-ounce seed-potatoes were cut lengthwise in equal pieces of 2 oz. each (as far as possible), and the cut pieces were immediately planted in soil which had been irrigated the day before.

From this it would appear that the size of the seed-potato is immaterial, but where the 4-ounce seed-potato was cut in two, germination was promoted and accelerated to a high degree. Six weeks after planting, 65·5 per cent. of the seed-potatoes had appeared whereas only 2·9 per cent. of the 2 oz. and the 4-ounce uncut seed-potatoes had come up. Therefore, although the final stand was more or less the same with all the treatments after 12 weeks, when the first frost had fallen, treatment (3) promised the largest yield. It was also found that, under the prevailing climatic conditions of the 1944 autumn, the percentage of cut seed-potatoes which did not appear owing to rotting or other causes, was not higher than the percentage in the case of uncut seed-potatoes. This is reflected in the figures for the final stand.

It may also be added that relatively high daily maximum

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Straw Mulch for Summer Vegetables.

Dr. V. A. Wager, Acting Officer-in-Charge, Botanical Station, Durban.

IN the coastal belt of Natal it is the general experience that vegetables are difficult to grow during the hottest summer months. The plants are usually small, often have an unhealthy colour, and produce no crop to speak of.

Insect pests and plant diseases are, of course, always worse when temperatures and humidities are high, but they are not responsible for the poor growth in this area. During midsummer the soil often becomes so hot that potatoes, for example, which are lifted in the late afternoon from a foot below the surface feel as though they have just been cooked.

FIG. 1.—Mealies showing the difference in growth due to the straw mulch on the right.

Much of the coastal soil is a red sand. With a combination of high temperatures and copious rainfall—the annual average at Durban being over 50 inches—what little humus there may have been in the soil soon disappears. Hence the soil has very little water-holding capacity, and as a result rapidly becomes dry and hot.

It was therefore reasoned that the heat was the cause of the poor growth, and that if the soil were kept cool with a covering of straw mulch, this would have a good effect. It certainly did, as was proved by a simple experiment.

Results of an Experiment.

Mealies were planted in midsummer in rows some 15 feet long. When the plants were a few inches high, four rows were completely covered with cut grass to a depth of about 4 inches, so that only the tips of the mealies showed through. The next four rows were kept bare, four more covered rows, and four bare, and a third repetition. All other conditions were the same: soil, fertilizer, and water. The season was wet with hot days in between showers. Weeds were pulled out by hand throughout the planting as they appeared. The mealies with the grass cover seemed to shoot ahead from the start. They grew to a height of 8 feet, and had thick robust stalks; the leaves were a dark green colour, and the cobs were large.

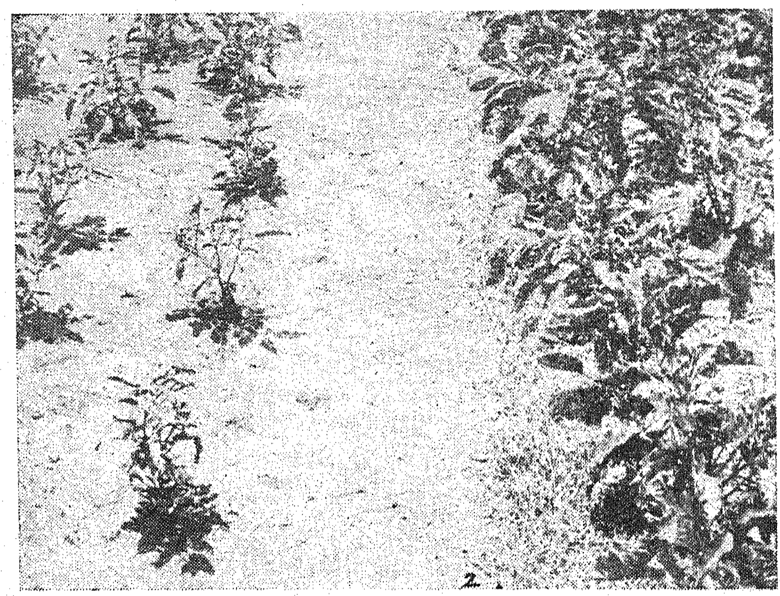


FIG. 2.—It is hard to believe that these brinjals or egg-plants are all the same age. The plants on the right are large and robust as the straw kept the heat off the soil.

Where the soil was bare, the mealies grew slowly, were stunted, and had a slightly yellowish colour. They reached a height of only about 5 feet, and had spindly stalks and small undersized cobs.

The same results were apparent in all three repetitions, and the difference in the plants was amazing.

This experiment was also carried out with tomatoes in one instance, and brinjals in another. The hay was again added when the plants were a few inches high. After a month or so, visitors would hardly believe that the plants were all of the same age, for those with the mulch were three to four times the size of the adjacent ones in the bare soil. In these two experiments all the plants were watered whenever the soil appeared to be getting too dry.

Ornamental plants in the flower garden also benefit greatly by this treatment, which, incidentally, saves a considerable amount of labour, since the mulch plants require watering far less frequently. Shrubs and trees also seem to improve when mulched.

In all cases, however, care must be taken that the mulch is not packed up against the stem of the plant, for this might cause rotting. It should be an inch or so away.

It has been argued that vegetable matter on the surface of the soil encourages "white ants". These pests usually do not attack growing plants, however, but if they should eat the mulch, more can be added. They could also be discouraged by spraying the mulch with arsenate of lead.

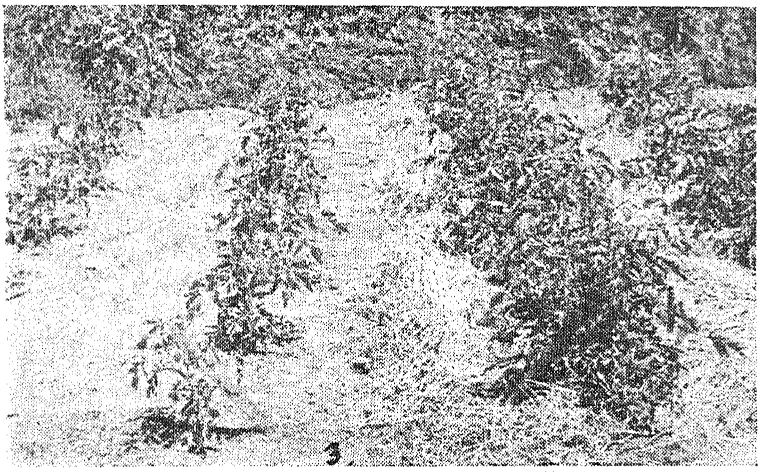


FIG. 3.—The small tomato plants on the left are in bare soil, whilst the adjacent ones have benefited from the straw mulch.

Any plant refuse will do for the surface covering: mulch from the humus pile in the corner of the garden, lawn or hedge clippings, pulled weeds, grass cut with a sickle from a neighbouring field, or, in the case of large towns, grass cut on street pavements.

For large-scale gardening it would be impossible to cut enough grass for a useful mulch, but householders are certainly advised to try a surface straw mulch on their vegetables this coming summer.

Price of Paratyphoid Vaccine.

The Director of Veterinary Services notifies for general information that the price of paratyphoid vaccine has now been changed from 2d. per dose to 2d. per single dose and 4d. per double dose. This change has become necessary owing to the more concentrated vaccine now being manufactured.

In ordering paratyphoid vaccine, farmers should note this change in price in order to avoid delay in the despatch of the vaccine.

To Clean Mirrors or Windows.—Use water alone, or water mixed with a little borax, washing soda, ammonia or methylated spirits. If soap is used, use as little as possible since it leaves a dull film on the glass. Rinse a cloth in cold water and wipe the glass thoroughly. Rub dry with smooth soft cloth, newspaper or chamois leather.

Whiting mixed with water or methylated spirits can also be used. It gives a marvellous shine to the glass.

Hints on Seed-Potatoes:— [Continued from page 568.

temperatures occurred during the first six weeks after planting. At a depth of 4½ inches—the depth at which the seed-potatoes were planted—the daily maximum temperatures varied from 86° F. to 96° F. During 60 per cent. of the days the maximum temperature was 92° F. or higher.

Treatment of Cut Surface.

It is not always advisable to treat the cut surface of seed-potatoes. If the soil is moist and cool (not waterlogged), as may be the case under irrigation, the best procedure is to plant seed-potatoes immediately. Under no circumstances must cut pieces be left in heaps for a time, for this may have disastrous results.

Where the possibility exists that the soil may be too dry or warm during the planting period, it is advisable to treat the cut pieces as follows in order to enable the cut surfaces to form a corky layer:—

Place the cut seed-potatoes in thin layers and cover them with wet bags and a layer of straw in such a manner that surplus water will not collect. After 8 to 10 days the cut surfaces will have formed a soft, pliable, protective corky layer. The seed-potatoes are then ready for planting.

Fertilizer for 1945.

AS far as can be gauged at this stage, only a slight improvement to a maximum of 20 per cent. can be expected in the 1945 supply position as compared with 1944. The 1945 supplies will in all probability meet only about 60 per cent. of the demand and will therefore have to be rationed once more.

Farmers who submitted the required application forms for 1944 and received permits accordingly, need make no further application for 1945. The 1944 application forms of all such farmers will be used for their 1945 allotments, and every one will in due course receive the required permits without asking for same. In most cases such 1945 permits will be mere duplicates of those issued in 1944, plus a percentage increase in accordance with any improvement in the supply position.

No fertilizer can be made available for expansion of existing farming operations. Those farmers who actually applied for fertilizer for 1944, but who desire to effect minor alterations in their farming operations, and consequently require other kinds of fertilizer for 1945, or those who changed farms and their addresses, should advise the Controller of Fertilizers accordingly before the end of October 1944.

New application forms for 1945 will therefore only be issued, upon application to the Controller, to those farmers who are starting new farming operations and to those who have not applied for fertilizer before. Such forms will be sent out early in September, and should be returned, duly completed, before 31 October 1944, to the Controller of Fertilizer, Private Bag, Union Buildings, Pretoria.

(Controller of Fertilizers.)

Early Weaning of Lambs for Saving Winter Cereal Pasture.

S. W. Bosman, Assistant Professional Officer, and H. C. Bonsma, Professional Officer, Sheep and Wool Research Section, College of Agriculture, Grootfontein, Middelburg, C.P.

WHEN lambs are produced on an extensive scale for marketing, as fat lambs, the feeding of ewes and lambs reperesents an important item of cost. A preliminary experiment conducted at the Grootfontein College of Agriculture with a view to determining the extent to which production costs can be reduced by weaning the lambs at an early stage, revealed the following:—

(1) It is possible to effect a saving of more or less 20 per cent. in this respect by weaning the lambs at an age of 8 weeks instead of allowing them to suckle until they reach a marketable weight. In the experiment merino ewes with cross-bred lambs were used; the ewes and lambs were fed on a dry ration consisting of lucerne hay and maize. No particular retardation of growth resulted from this treatment.

(2) Good results can be obtained by weaning the merino cross-bred lambs at the age of 8 weeks and grazing them on winter cereals.

The feeding of ewes with lamb at foot on a dry ration is, however, an uneconomic proposition since succulence has a stimulating effect on the milk production of the ewe. If the farmer thus utilizes winter cereal pasturage, he can expect his lambs to make more rapid growth and consequently his production cost on feed will be less than in the case of the dry ration.

As regards production costs on lambs subjected to the above two systems of control, the following figures are interesting: Bonsma and Engela (1) found that if a dam and her lamb receive a daily ration of 3 lb. of lucerne hay and 1 lb. of maize, production costs of feed to produce such a lamb of 60 lb.—a weight which is reached within 118·4 days—amount to 198 pence. Turpin and Marais (2) found that the grazing costs per sheep amount to 34·94 pence if the wheat is grazed three times a season.

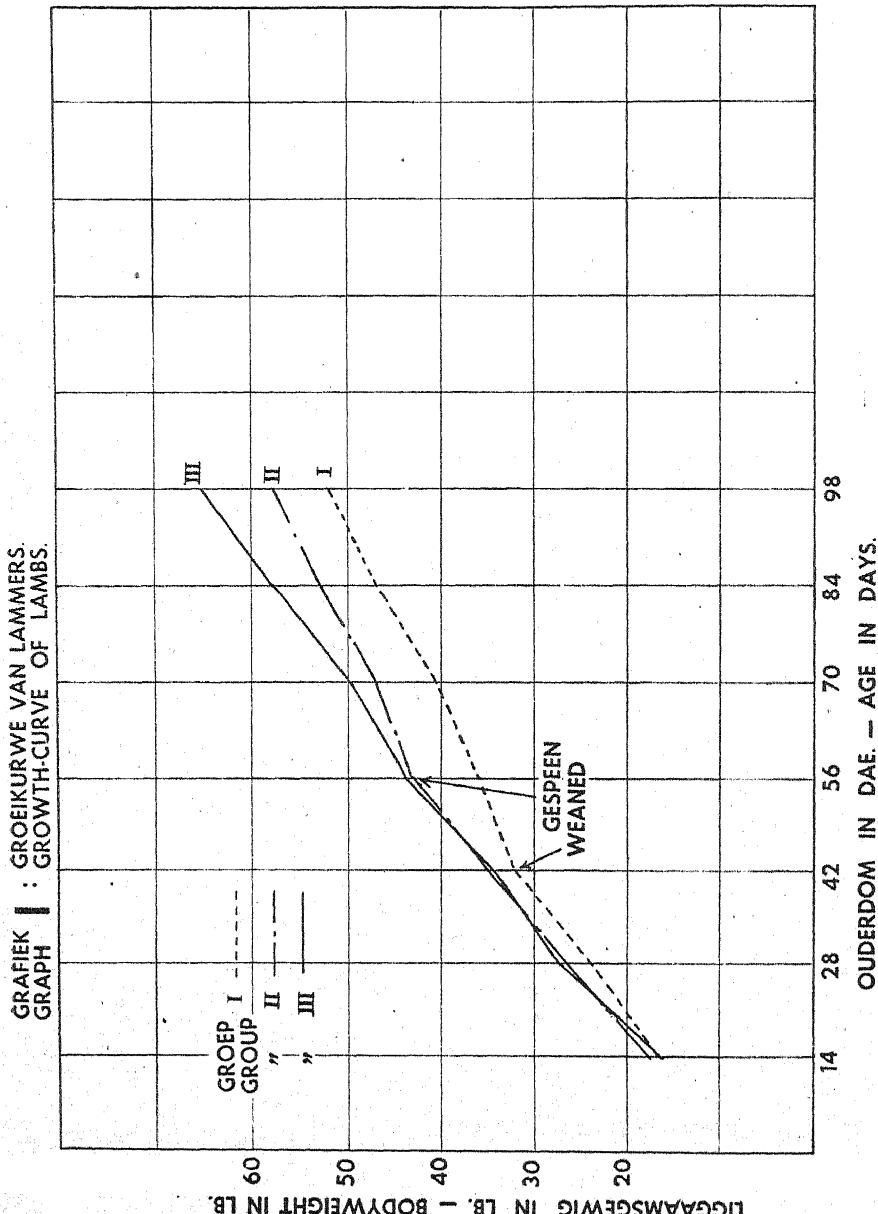
If, therefore, it is assumed that a merino ewe running on green pasture can nurse a cross-bred lamb to a weight of 60 lb. within 3½ months and that a lamb during this period uses ¼ the amount of wheat consumed by the ewe, production costs of such a lamb will amount to 153 pence.

In both calculations labour costs in connection with feeding are not included in the production costs, else the difference between production costs in respect of these two methods of control will be even greater, for the feeding of a dry ration to ewes requires much more labour than does pasturing sheep on crops. Fencing costs are included in the above estimates.

In an intensive system of fat-lamb production on green pastures under irrigation the success of the undertaking mainly depends on the rapid growth of the lambs until they reach marketable weight. This rapid growth of the lambs is determined by the type of ewe, her condition at the time of lambing and the feed available from the time of lambing until the marketing of the lamb; i.e.

(1) FARMING IN SOUTH AFRICA, Sept. 1941—"Weaning Lambs at Various Ages."
(2) FARMING IN SOUTH AFRICA, Sept. 1933—"Grazing Winter Cereals Under Irrigation in the Karroo—II Costs of Grazing."

the lamb must reach a weight of 60 to 65 lb. with a carcase weight of 30 to 35 lb. at an age of 3 to 3½ months.



In practice, however, green pastures are, as a result of climatic conditions and other factors, not always adequate for maintaining both ewes and lambs until the latter reach a good finish.

In the Karroo such a critical period of scarcity mostly falls in July and August; as a result of the prevailing cold very little growth takes place during these months, which are appropriately termed "dead". There is thus a real danger of a grazing shortage occurring during the end of July and the beginning of August unless winter cereals are sown early, i.e., from February to March, and several camps are also available.

Various methods may be applied under practical conditions for bridging the periods of scarcity. Ewes with lambs may, for example, be run for only 2 hours per day (1 hour in the morning and 1 hour in the afternoon) on green pastures and for the rest of the day on good veld in an adjoining camp.* Another method adopted on a certain farm is to keep the ewes and lambs on the pastures until the latter can feed properly (i.e. until the age of 4 to 6 weeks) and then to separate them from the ewes for the greater part of the day, allowing them alone on the pastures and running the ewes on veld. In the afternoon the lambs are put with the ewes and again separated from the ewes the next morning. This method has yielded good results with merino lambs. It allows the lambs the maximum use of green pasture and the ewes the opportunity for peaceful grazing without being disturbed by suckling. It also brings about considerable economy as far as grazing is concerned, for the lambs apparently grow as rapidly as when they are run with the ewes continuously, while the ewes do not feel the effect of suckling as much as would have been the case otherwise. The advantages of early weaning are outlined in the results of the above preliminary experiment(1).

Suitable Age for Weaning and Saving of Pasture.

The second experiment thus aimed at (1) determining the earliest age at which lambs from cross-bred merino ewes could be weaned without impairing the growth of the lambs, when both ewes and lambs are run on green pasture from the time the lamb is born or shortly afterwards and (2) approximately determining what could be saved on pasture.

The experiment was carried out on wheat pasture during the winter of 1941. The ewes were all merino cross-breds—merino flock ewes mated to Dorset Horn, Border Leicester and Romney Marsh rams. The triangular-cross lambs used in the experiment were out of these ewes by Southdown rams. The experimental groups consisted of 11 ewes and 11 lambs each, and weaning took place as follows:—

Group I.—Weaned at the age of 6 weeks (42 days).
Group II.—Weaned at the age of 8 weeks (56 days).
Group III.—Control, i.e. no weaning.

The body weights of ewes and lambs were taken at fortnightly intervals after a starvation period of 14 to 18 hours; the lambs were, however, allowed to run with the ewes and thus not prevented from suckling. When the lambs were weaned their weights too were taken and then the ewes were removed from the pasturage to veld.

The lambs were slaughtered when their fortnightly weighings showed a live weight of 60 lb. and more. Lambs weighing from 55 to 60 lb. were also slaughtered if they had attained a good finish or if they had gained very little during the previous fortnight. Full slaughtering particulars of all lambs were taken and the carcases graded according to the export standard requirements for fat lambs. Use was made of a scoring card taking fat cover and conformation into account; 50 marks were awarded in respect of each of these requirements and grading was then carried out as follows:—

Grade A, 76 marks and more; Grade B, 66 to 75 marks; Grade C, 56 to 65 marks while the carcases scoring less than 56 marks were rejected.

* Results of experiments carried out at the Grootfontein College of Agriculture during 1943 will be published shortly.

There were not sufficient camps available for accommodating each group separately with a view to determining the saving on pasture. All ewes and lambs were grazed together and the pasture consumption thus calculated in terms of sheep days.

The saving on pastures was then calculated as follows:—From the number of sheep-days for the control group of ewes, beginning from the time that the groups of 6 and 8 weeks respectively were weaned until the lamb reached a weight of 60 lb., was deducted the difference in lamb-days between the 6- and 8-week groups and the control until the lamb reached a weight of 60 lb. The writers are not aware of any experimental data which indicate the ratio between feed consumption of the lamb and the ewe on unlimited green pasture. Consequently the approximate consumption of the lambs was assessed as follows: 4 lamb-days, from birth to a weight of 60 lb., were taken as equivalent to 1 sheep-day; this average was adopted since the feed consumption of the lamb at a very early age is pratically nil, whereas it amounts to about 50 per cent. of that of the ewe when the weight of the lamb approaches 60 lb. The loss in pasture as a result of the fact that it took the weanling groups longer to reach the 60 lb. mark, was calculated on the assumption that two lamb-days are equivalent to one sheep-day since at that stage the weight of the lambs of the weanling groups is comparatively near the 60 lb. mark.

The effect of the saving on pasture is illustrated by the following example: The control group reached the 60 lb. mark in 91 days and the 6 week group in 123 days. The consumption period in grazing days of the control group then equals 91 sheep-days per ewe $+ \frac{91}{4}$ sheep-days per lamb $= 113 \cdot 75$ sheep-days. In 91 days the consumption of the 6-week group is 42 sheep-days per ewe $+ \frac{91}{4}$ sheep-days per lamb $= 64 \cdot 75$ sheep-days.

In addition, the lamb during this period consumes feed for a further $(123\text{-}91) = 32$ days and for this period 2 lamb-days were regarded as equivalent to 1 sheep-day. Consequently, the total consumption period per lamb was $64 \cdot 75 + \frac{32}{2} = 80 \cdot 75$ sheep-days.

The pasture saving, expressed as a percentage in the case of the 6-week group, was then as follows:—$\frac{113.75\text{-}80 \cdot 75 \times 100}{113 \cdot 75} = 29$

Results and Comment.

1. Growth of Lambs.

The average fortnightly weights of the three groups of lambs and also the calculated age in days at which the 60 lb. mark was reached is given in Table 1 (A). The weights were calculated on a basis of exact fortnightly intervals and the age at which a live weight of 60 lb. was reached, was also calculated according to the individual growth graphs of the lambs, which are given in graph 1. For consumption the data of the previous experiment (1) are given in Table 1 (B) for purposes of comparison.

In comparing the results of the two experiments the following factors should be taken into account.

(*a*) *Feed.*—In this experiment, Groups I to III [Table 1 (A)] were kept on winter cereals from the time the lamb was born until it was slaughtered, whereas the animals of the previous experiment [Table 1 (B) in each case received a dry ration of lucerne and

TABLE 1.—(A) *Summary of Lamb Weights.*

Group.	No. of lambs.	Treatment of lambs.	Average weight at age of—								Average calculated age in days within which a weight of 60 lb. was reached.
			14 days.	28 days.	42 days.	56 days.	70 days.	84 days.	98 days.	112 days.	
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	
I	11	Weaned at the age of 6 weeks...........	16·9	23·7	31·8	35·4	40·1	46·1	51·8	57·0	123
II	11	Weaned at the age of 8 weeks...........	17·5	26·1	34·9	42·4	47·0	52·8	57·7	—	109
III	11	Control: Not weaned..	16·7	26·3	34·8	42·8	49·8	57·5	64·8	—	91

TABLE 1 (B).

Group.	No. of lambs.	Treatment of lambs.	Average weight at age of—								Average calculated age in days within which a weight of 60 lb. was reached.
			1–2 wks.	7–8 wks.	8–9 wks.	9–10 wks.	10–11 wks.	11–12 wks.	12–13 wks.	17–18 wks.	
			lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	
I	7	Weaned at the age of 8 weeks.............	14·3	30·9	33·4	34·7	36·8	39·6	41·4	57·1	126·0
II	6	Weaned at the age of 10 weeks..........	16·1	33·4	35·9	39·1	41·3	43·7	47·0	63·2	118·7
III	6	Weaned at the age of 12 weeks..........	15·1	32·8	35·3	38·0	39·9	43·3	46·3	61·3	118·5
IV	7	Control: Not weaned.	14·6	31·6	34·4	36·2	39·2	43·1	45·6	60·5	118·4
V (*a*)	3	Weaned at the age of 8 weeks...........	14·8	36·8	39·2	41·3	44·0	47·8	53·0	66·2	104·7
V (*b*)	3	Weaned at the age of 10 weeks..........	14·7	34·7	37·2	39·5	40·3	42·0	44·8	59·3	119·7
V (*c*)	3	Weaned at the age of 12 weeks..........	16·0	37·3	39·8	42·6	44·5	49·0	53·3	66·5	110·7

maize, except in the case of group V (*a*), (*b*) and (*c*) where the lambs were placed on winter cereals after weaning.

(*b*) *Breeding.*—In the previous experiment the ewes were all merinos with cross-bred lambs. In this experiment cross-bred merino ewes were used with Southdown triangular-cross lambs.

If the growth graphs, and especially the age in days at which a live weight of 60 lb. was reached are compared, it is remarkable that the lambs of this group grew much more rapidly than those of the previous experiment (control groups and 8-week weanling groups). These results, therefore, prove that feeding and breeding have a particularly important bearing on the rapid growth of lambs.

This fact emphasizes the necessity for collecting experimental data with a view to determining whether it is indeed possible to wean lambs which have made rapid growth from birth, at an earlier age than 8 weeks.

2. Growth of Lambs Prior to Weaning.

As regards the growth of lambs prior to weaning, the following facts are revealed:—

(*a*) At the age of 14 days the weights of the various groups showed no particular differences.

(*b*) At the age of 42 days the average weights of Groups I, II and III were 31·8, 34·9 and 34·8 lb. respectively—a small difference in favour of Groups II and III as compared with Group I.

The difference must be ascribed to individual variations in the growth of lambs within the groups.

(*c*) The growth of the lambs from birth to the age of 42 days in all three groups may be regarded as satisfactory for fat lambs.

3. Growth of Lambs Subsequent to Weaning.

As can be expected, the most critical period in the growth of weanlings is during the first two weeks after weaning. This is due to the fact that the lamb then has to fend for itself without the aid of its dam, and so has to adapt itself to new feeding conditions. How far the lambs succeeded in bridging this critical period is reflected in their later growth up to marketable weight. This growth is analyzed in Table II.

TABLE II.—*Comparison of growth of Various Groups.*

Average increase in weight.	Group I.	Group II.
	lb.	lb.
During fortnight prior to weaning	8·1	7·5
Control group for corresponding period	8·5	8·0
During fortnight after weaning	3·6	4·7
Control group for corresponding period	8·0	7·0
From weaning till age of 98 days	20·0	16·4
Control group for corresponding period	30·0	22·0
Average daily increase in weight from the age of 14 days to weaning	0·53	0·59
Average daily increase in weight for control during corresponding period	0·65	0·62
Average daily increase in weight from weaning till age of 98 days.	0·357	0·364
Average daily increase in weight for control during corresponding period	0·54	0·52

From Table II it appears—

(*a*) that during the fortnightly period immediately before weaning the lambs in all three groups showed a good increase in weight;

(*b*) that during the fortnightly period following immediately on weaning a considerable retardation in the rate of growth of the two weanling groups is observed. This retardation is more pronounced in the group weaned at the age of 6 weeks than in that weaned at the age of 8 weeks.

(*c*) that during the period from weaning till the age of 98 days both weanling groups made less growth than the control group. The average daily increase in weight in respect of the groups which were weaned at the age of 6 weeks was less than that of the group weaned at the age of 8 weeks.

From the above it is clear, therefore, that the weaning of lambs had a general retarding influence on the rate of growth. Consequently a statistical analysis of which a summary is given in Table III, was made of the period within which a live weight of 60 lb. was reached.

According to this statistical analysis it appears that the growth of the lambs was significantly affected by weaning at the age of 6 weeks, whereas weaning at the age of 8 weeks had no significant retarding effect in this respect.

On closer examination of the figures it is found, however, that the groups themselves show considerable variation in weights in respect of lambs at the ages of 6 and 8 weeks. Consequently these figures were subjected to a further statistical analysis with a view to determining whether there is any correlation between the weight of the lamb at weaning and the number of days it takes to reach a live weight of 60 lb.

A summary of this analysis appears in Table IV.

TABLE III.—*Summary of Statistical Analysis of Period in Days in which a Live Weight of 60 lb. was reached.*

Groups compared.	Treatment.	Average period within which a weight of 60 lb. was reached.	Difference.	P. Value.	Significance.
		Days.	Days.		
I and II	Weaned at the age of 6 weeks........	123	—	—	—
	Weaned at the age of 8 weeks........	109	14	P>. 05	Insignificant.
II and III	Weaned at the age of 8 weeks........	109	—	—	—
	Control—not weaned................	91	18	P>. 05	Almost significant.
I and III	Weaned at the age of 6 weeks........	123	—	—	—
	Control—not weaned................	91	32	P<. 01	Significant.

TABLE IV.—*Correlation between Weight at Weaning and Time required to reach a Live Weight of 60 lb.*

Experiment animals.	No. of pairs.	Measure of independent factor X.	Correlation Coefficient.	Value of P.	Coefficient.	Comparison.
Lambs....	22	Weight of lamb at weaning	—·82	P.<01	—2·19	Y=196·22. —2·19 X.

From the above it will be observed that a significant negative colleration exists between the weight of the lamb at weaning and the number of days within which such a lamb reaches a weight of 60 lb. i.e., the heavier the lamb at weaning the shorter the period it requires to reach the 60 lb. level.

In view of the close correlation between the weight of the lamb at weaning and the number of days which it needs for attaining a marketable weight, it is desirable to choose the time for weaning on a basis of weight rather than on a basis of age. Moreover, it will be more practicable to wean all lambs above a certain weight than at a certain age.

4. Slaughter Results.

The slaughter data of the lambs are given in Table V.

TABLE V.—*Summary of Slaughter Data of Lambs.*

Group.	Average age at slaughter.	Average slaughter weight.	Average warm carcase weights (inclusive of kidneys and kidney fat).	Average slaughter percentage. Warm carcase on empty body weight.	average fat distribution over back muscle.	Grading % A.	Grading % B.
	Days.	lb.	lb.		cm.		
I	132	62·1	28·4	55·0	0·22	55	45
II	122	64·5	30·9	57·2	0·23	73	27
III	113	71·4	36·8	58·4	0·34	100	—

From Table V it is clear that the lambs of the weanling groups were in all respects inferior to those of the control. The 6-week group was inferior to the 8-week group. It is of practical importance that the lambs of the weaning groups produced carcases much lighter than those of the control group in spite of the fact that they were older. A further fact which merits special attention is that early weaning also adversely affected the grading of carcases.

The growth graphs and particularly the slaughter data of the two weanling groups tend to show that, if the production of prime lambs is aimed at, the weaning of lambs cannot be recommended.

Weaning of lambs at such early ages as 6 to 8 weeks will prove a policy of great practical importance not so much in the case of fat lambs as in that of merino lambs. With the latter the only requisite is a well-growing condition. Consequently it is thought that, when grazing becomes poor, both ewes and lambs will profit if the lambs are weaned at this age and then moved to green pasture.

Saving of Pasture by Early Weaning of Lambs.

A calculation of the grazing saved is given in Table VI.

TABLE VI.—*Calculation of Pasture saved per Ewe with Lamb.*

Groups compared.	No. of ewe days on grazing until lamb reaches weight of 60 lb.	Difference in sheep days saved in favour of weanling group with reference to ewe.	Age of lamb when reaching the 60-lb. mark.	Difference in sheep days saved in favour of control with reference to lamb.	Net saving.	Percentage pasture saved by weaning.
			Days.		Sheep days.	
I and	42	49	123	16	33	29
III	91	—	91	—	—	—
II and	56	35	109	9	26	22·9
III	91	—	91	—	—	—

[The number of sheep-days required to obtain a good finish in a lamb, is the sum of the number of days which the control ewe will run with the control lamb on pasture (from birth until a weight of 60 lb. is reached. 4 Lamb-days are considered the equivalent of 1 sheep-day. The control took 91 days. The number of sheep-days $=91+\frac{91}{4}=113\cdot75$. The number of sheep-days lost as a result of weaning is the difference between the weanling group and the control (2 lamb-days were considered equivalent to 1 sheep-day since at this stage the weight of the lambs approached the 60 lb. mark.)]

From Table VI it appears that the saving effected in pasture by weaning at an age of six weeks, as compared with the control amounts to 29 per cent. as against 22·9 per cent. when the lambs are weaned at the age of 8 weeks.

On the same land where this experiment was carried out the average carrying capacity of wheat was 12·4 sheep per morgen for 4 months over a period of 5 years. This means that a considerable saving can be effected on pastures by weaning lambs at an early age.

 [*Continued on page 583.*

Land Service Tackles Soil Erosion.

J. J. Strydom, Extension Officer, Frankfort.

THE Land Service Association of Frankfort recently held a camp in this district. Such a camp can be regarded as a new development in our campaign against soil erosion. The main idea is to impress upon the younger generation the danger of soil erosion and to enlist their services. They should be prepared not only to hear, read and talk about soil erosion but also to handle a pick and shovel, and to use the plough and tractor in furtherance of the campaign.

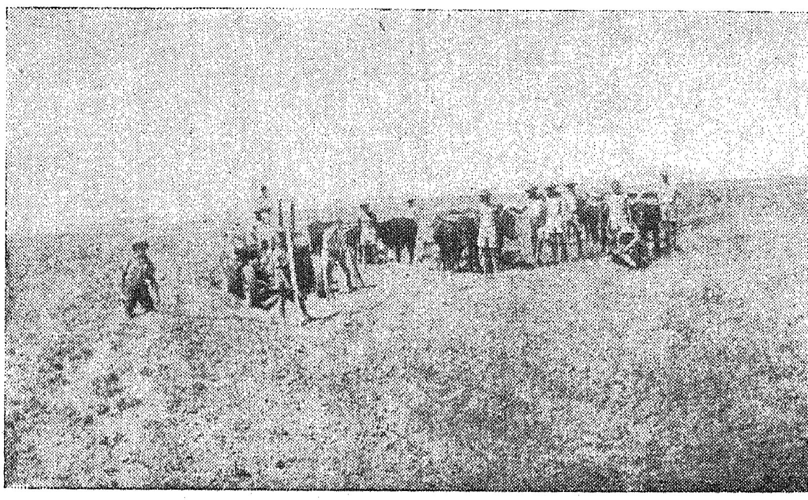


FIG. 1.—Contour channel ploughed according to the island method: almost 2 feet deep.

To-day very few people are unaware of the fact that soil erosion implies the gradual removal of our most fertile soil, which constitutes our most valuable national asset, by agencies such as water. Much more remains to be done, however, before it can be definitely stated that the nation has taken the bull by the horns, because our efforts are by no means sufficient for arresting the danger. A certain farmer recently stated that he was prepared to prophesy that in the near future a farmer would not be judged by his bank balance but by such facts as the presence or absence of contour banks on his cropping lands and judicious or overgrazing of his veld.

This camp was pitched during the April school holidays on the farm Fonteintjie, owned by Mr. Fanie Burgers, and during the September holidays another will be pitched somewhere in the Heilbron district. It was gratifying to see how the young people enjoyed the camping out. The number who participated was thirty-four, including four young ladies, who undertook the cooking. All were animated by the great idea that they personally were doing something towards healing the wounds which foolish humanity had inflicted on mother earth.

It is appropriate to point out that our young people too are concerned about the future of our country and are by no means as easy-going as many would like us to believe. The organizers

of the land service camp have found that as soon as the young people learn the object of the movement they are quite prepared to co-operate. As a result of their zeal the camp was continually visited by their parents, friends and others interested. Even people who do not derive their living direct from the soil came to study the method applied in combating soil erosion. Consequently the public gained a good idea of land contouring and of the methods of making contour banks by means of the plough and also of the measures which can be taken to promote the silting of sloots, so that in their area the Department of Agriculture and Forestry will only be too willing to assist. The following are a few hints which will contribute towards the success of such a camp.

Necessary Organization.

(1) The provisional committee should consist of: chairman, secretary and 5 farmers. They do the recruiting work, make arrangements for housing, food, implements, etc.

(2) A sympathic farmer on whose farm the camp can be pitched and who is prepared to give every possible assistance. The rest may be obtained from his neigbours. The most suitable farm is one to which transport can easily be arranged and on which a wide range of work can be performed.

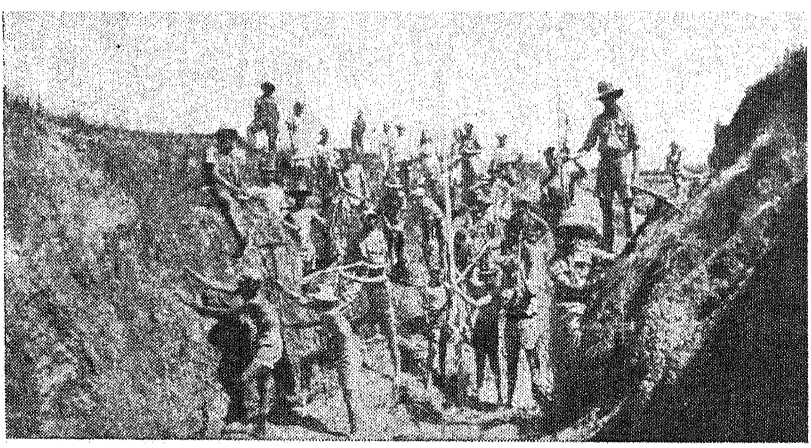


FIG. 2.—A donga caused by erosion and running right through a cultivated land.

(3) Make provision for recreation by way of lectures, music, songs, folk dances, etc. Every member who can handle a musical instrument must bring it. A few ladies who undertake the cooking can do much towards creating the right atmosphere.

(4) The campers should choose their own leaders for arranging camp activities, time-tables, etc.

(5) Plans for anti-soil erosion works are drawn up by an expert, so that they may be technically correct and have a maximum educational value. The expert must be in position to pay a personal visit to the camp with a view to explaining the plans and to ensure

that they are carried out correctly. He must be interested in the combating of soil erosion and be able to arouse the interest of all

FIG. 3.—Round the "flesh-pots of Egypt".

with whom he comes into contact. The realization of the real objective in camping will thus to a large extent depend on him.

Early Weaning of Lambs for Saving Winter Cereal Pasture:—

[Continued from page 580.

Summary and Conclusions.

1. Weaning cross-bred lambs at an age of 6 weeks retarded their growth; their carcases had to be graded lower than those of a comparable group which was not weaned.

2. Where lambs were weaned at the age of 8 weeks the set-back suffered in body-weight gains was insignificant.

3. When lambs are weaned at ages of 6 and 8 weeks the saving effected on pasture is 29 per cent. and 22·9 per cent. respectively. In the previous experiment on a dry ration about 20 per cent. was saved on feeding costs by weaning the lambs at an age of 8 weeks.

4. The advantage gained by weaning early is partly neutralized by the fact that the lambs do not attain the finish desired at a weight of 60 lb. or more.

5. There is a significant negative correlation between the weight of the lamb at weaning and the number of days within which it attains a good finish ($r = -0 \cdot 82$, $P < \cdot 01$).

6. With a view to early weaning, *weight* is recommended as a better basis for weaning than age.

7. Early weaning is more desirable and practicable in the case of merino lambs than in the case of cross-bred prime lambs.

Removal Of Lime In Kettles.—Pour a little dilute solution of hydrochloric acid into the kettle and leave it undisturbed until the acid has dissolved the lime. Repeat the process if necessary. Wash and rinse the kettle thoroughly before use.

Dry and Wet Gallsickness.

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THE term "gallsickness", in various combinations, is used by farmers to denote a variety of diseases. Veterinarians usually consider gallsickness to be synonymous with anaplasmosis, and drunk gallsickness with heartwater. Dry and wet gallsickness, however, have nothing to do with anaplasmosis or heartwater, but are diseases in which digestive disturbances occur as a result of the ingestion of large quantities of dry feed of low nutritive value. Where the digestive disturbances result in constipation, the term "dry gallsickness" is used, and where they result in diarrhoea, the term "wet gallsickness" is used. As will be shown in the course of this article, the digestive disturbances form only a part of the picture of the disease. The disease is actually the result of malnutrition which leads especially to an energy deficiency.

Reason for Severe Stock Losses.

It is well known that severe losses among stock occur in South Africa every winter from poverty. Every farmer knows that when an animal does not receive sufficient food it gradually loses weight and, if the underfeeding continues long enough, it will eventually die of weakness. What is not so generally realized ,however, is that an animal may die of undernourishment long before it is actually in poor condition. When this happens, the real cause of death is usually not realized, and some disease or other is often suspected. In order to understand how an animal can die of starvation when still in good condition, we must understand some facts of the working of the body.

Body Requirements.

The animal body is like an engine: it burns fuel, which it derives from the food, in order to produce the heat and energy required to keep it "running". The amount of fuel required to keep the body going depends very largely on the state of the animal, climatic conditions, and the work done. Young growing animals and pregnant or milking females naturally need a large amount of extra food. Walking also uses up a large amount of energy. Food must also be used to maintain the body temperature, and this requires a considerable amount of energy when the weather is cold. Long-sustained fright or excitement also increases the energy output, as is shown by the way stock often lose weight on a train journey at a rate out of all proportion to the time they may have been without food. During such a train journey the animals usually remain standing, thereby also increasing the energy output.

When the food intake exceeds the body requirements, the animal tends to put on weight by building up extra muscle and fat, which act as a store of nutriment and which can be drawn upon by the animal in time of need. When the amount of material required by the body exceeds the intake, the animal uses these reserves of energy-producing substances to make good the deficiency. These body reserves can be divided into three classes, namely, carbohydrates (mainly sugars), fats, and protein (largely muscle). All these classes of material can be used by the body for the production of energy, but only the sugars can act as fuel for the muscles, and

there has to be a certain amount of sugar in the blood for life to continue. On an inadequate diet, therefore, the animal will first use up its reserve of carbohydrates. When this is exhausted, it must convert the other stored materials into sugar. We will now consider the classes of stored energy-producing substances separately.

(*a*) *The carbohydrate reserve.*—The main storehouse for sugar is in the liver. As the sugar in the blood is burned up by the muscles it is replaced from the liver, whose store will decrease and soon become exhausted, unless there is a constant flow of new carbohydrates from the digestive tract. The store of carbohydrate in the body is not very great. At Onderstepoort, for instance, it has been found that a pregnant sheep can use up all its reserve in from three to five days. The same would probably apply even to non-pregnant animals which are exposed to severe cold or which have to perform a considerable amount of muscular excercise, such as walking.

(*b*) *The fat reserve.*—Fat does not act as a source of carbohydrate for the body, but can be burned up for the production of heat. This is one reason why fat animals can stand cold so well, the other being that the layer of fat under the skin acts as an insulator and prevents the loss of heat from inside the body. When too much fat is burned at once it cannot all be fully destroyed, and the half-burned fat circulates in the blood and acts as a poison. We may compare this process of combustion with that which occurs in a paraffin stove. When the wick is at the correct height and the right amount of paraffin is being burned, there is a strong flame and plenty of heat, but when the wick is too high and too much paraffin is present, the flame smokes. The smoke would represent the poisonous substances in the blood mentioned above. This is the reason why, strange as it may seem, it is safer to starve an animal that is in normal condition than one that is very fat. This was shown in a recent experiment at Onderstepoort. When six very fat and six normal sheep were put on a diet of poor quality dry grass, the fat ones all died suddenly within a month, while still in very good condition; the others merely lost weight slowly, and nine months later were very poor but still alive and healthy. An animal can usually use its stored fat in safety, however, unless it has to be used very quickly. The disease of pregnant ewes known as " domsiekte " is caused in this way. Here the requirements of the body are very large, owing to the state of pregnancy, and any disturbance in the feeding of the ewe may cause domsiekte, especially if the animal is in good condition. A similar condition may arise in very fat stock which are being railed to market.

(*c*) *The protein reserve.*—Protein, which is stored mainly as muscle, can also be used to provide either sugar or energy direct. but for this purpose it must first be broken down. Part of the protein (the nitrogenous portion) is excreted by the kidneys, and the rest is used or converted into sugar. The excretion of the waste portion, however, throws an extra load on the kidneys and, if the process takes place too rapidly, these products may accumulate in the blood and cause poisoning.

The body can, therefore, use its stored energy, but only at a certain rate without danger. The speeed at which the stored materials must be broken down will depend on the difference between the amount of energy required and that being taken in the food. Where this gap is not too large, the animal will get thinner by the dis-

appearance of fat and muscle, and this process can go on until there is practically nothing left, i.e. until the animal is only " skin and bone ". If the gap between expenditure and intake is too great, however, death may result long before this stage has been reached. It must be remembered that this position can arise either as a result of a very high expenditure or a very low intake, or as mostly happens, from both. Thus veld that might keep cattle going in mild winter weather, may suddenly prove quite inadequate during very cold weather, rain or snow, or the dry sheep may be quite all right and the heavily pregnant ewes may get domsiekte.

Digestive Disturbances.

It must be remembered that the food is of very little value to the body until it has been digested and absorbed. In other words, if digestion stops, the animal will starve. This is of especially great importance in the ruminants (cattle and sheep). During the winter a large proportion of the grazing consists of fibre, and this cannot be digested by the animal direct, but must first be broken down by micro-organisms (yeasts and bacteria) in the paunch. These organisms, however, cannot live on fibre alone, and as the diet becomes poorer, they tend to decrease in numbers until finally the normal fermentation in the paunch may cease entirely. The contents of the paunch may then become a dry solid mass, the animal ceases to chew the cud, and loses its appetite. As the plant fibre is no longer being broken down, course pieces of it pass into the intestines where they may become packed, causing constipation, or they may cause diarrhoea by irritation. Once this stage has been reached, the intake of the body falls to practically nil, while, in the case of diarrhoea, the output is increased by the loss of mucus and possibly blood.

With the foregoing facts in mind, it may be easier to understand the following description of what may actually happen to stock during the winter. Most of the deaths due to underfeeding naturally take place in winter and are more common on the highveld, owing to the poorness of the grazing on the one hand and the high expenditure of energy on the other. This extra need for energy is due to the cold and the increased exercise necessitated by the search for food and often also for water.

Animals that have recently been moved are the most likely to suffer, both because of the extra expenditure of energy while trekking, or, if railed, by the nervous tension as well as the fact that a change of diet and surroundings may cause a loss of appetite and digestive disturbances.

Usually there are no losses until digestive disturbances set in. Under most conditions the intake of the animal, small as it may be, is sufficient to allow the body to use its reserves in safety so that nothing more serious than a gradual loss in weight occurs. Once the digestion is affected, however, the animal is thrown entirely on its already depleted reserves and death may take place in a few days. It may be argued that in such cases the animals actually die of the digestive trouble, which is in a sense true, but the fact is that the digestive disturbances are themselves due to the poor diet. Furthermore, should such trouble arise when the animal is in normal condition, it would probably not prove fatal.

Symptoms.—The first symptoms observed are digestive disturbances. The appetite is impaired whilst the affected animals either develop diarrhoea or become constipated. The diarrhoea may be bloody and in the case of those animals which are constipated, the faeces may be covered with mucus and even blood. The animals rapidly lose condition and the eyes become sunken, due to the disappearance of fat from the tissues surrounding the eyeball. Due to anaemia the mucous membranes are pale. The anaemia may be aggravated by internal parasites. The pulse is rapid and strong. The contents of the paunch are firm, whilst the movements of the paunch are weak or absent. Some of the affected animals may be inclined to charge. Before death the affected animals go down and may struggle violently so that severe bruising may result. Cases have been observed in which one horn was driven deeply into the soil as a result of repeated efforts to rise.

Some animals die suddenly, whilst the majority are ill for a few days. Others may be ill for weeks. Few animals recover.

Post mortem appearances.—Extensive bruising may be observed. The mucous membranes are pale and the blood watery. There is practically no fat in the carcase, but there is usually very little muscular atrophy. Fluid is present in the body cavities. The lungs are redder than normal. The contents of the paunch are relatively dry. The leaf stomach may be impacted. The fourth stomach, if not empty, contains coarse undigested material. The folds of the fourth stomach may be swollen and the mucous membrane may be reddened. The mucous membrane of the small intestine, which is usually empty, may be reddened. The large intestine may be empty and contain hard masses of faeces, whilst its mucous membrane may be reddened.

Diseases which may be confused with the above disease are—

(1) Poisoning by arsenic and poisonous plants such as "tulp", which cause diarrhoea.

(2) Diplodiosis, which results from the ingestion of mealie cobs infected with the fungus *Diplodia zeae*. (This disease frequently occurs in cattle running in harvested mealie lands.)

(3) Anaplasmosis (gallsickness), which may be suspected in cases where the animals are constipated.

(4) Heartwater, since in many cases of heartwater a severe diarrhoea is observed. (Heartwater may be introduced into the Transvaal highveld by moving stock on to the highveld from the bushveld.)

(5) Blackquarter, which may be suspected where animals have severely bruised themselves.

(6) Anthrax, which should be suspected in those cases where the animals die suddenly.

(7) Internal parasites such as conical fluke and hookworms, which may cause diarrhoea.

Pamphlets dealing with all these diseases are obtainable from the Director of Veterinary Services, P.O. Onderstepoort. In all these pamphlets full details are given concerning the specimens which should be submitted to the Division of Veterinary Services in order to confirm or exclude the presence of these diseases.

Treatment.

The correct treatment for malnutrition is naturally to provide better food. A sudden change in the ration should, however, not be made, as this will aggravate the digestive disturbances. The animals must gradually be brought on to an adequate diet.

It must be remembered, however, that once the disease has developed too far, the animal will refuse all food. In such cases the animals will simply have to be force fed at least twice daily by dosing gruels made from a good dairy meal. To such gruels sugar or molasses must be added so that each animal consumes one pound of sugar or molasses daily. Sugar acts as a laxative and, in those animals suffering from a diarrhoea, may aggravate the condition. In such cases the quantity of sugar given must be reduced if necessary. It will also be of value to inject a solution of glucose into the jugular vein. A full-grown beast should be given 1 ounce of glucose dissolved in 200 c.c. ($\pm$ 7 oz.) of water every 3 to 4 hours. Part of the glucose solution may advantageously be injected under the skin. The total quantity of the solution is, however, too great for it all to be injected under the skin.

As has been explained, the digestive disturbances are the result of a decrease in the number of micro-organisms in the paunch, but these micro-organisms can be increased by dosing animals with the liquid part of the contents of the paunch of a healthy bovine or sheep. As much as possible of the liquid part of the contents of the paunch should be administered to each affected animal. This procedure is obviously practical since farmers slaughter cattle and sheep for their own consumption.

Animals suffering from constipation should be treated as follows:—

(a) Give a full-grown beast one to two pounds of Epsom-salt and half a pound of ordinary table salt. The affected animals should be given free access to water.

(*b*) Massage the paunch of the animal by gripping the back of the animal with both hands and repeatedly pressing the knee into the left flank.

(*c*) If the above treatment is not effective, the animal can be given 2 to 4 pints of raw linseed oil or liquid paraffin to which 1 drachm (=1 teaspoonful) of croton oil or 1 pint of castor oil has been added.

Cases of diarrhoea are treated by administering twice daily to a full grown beast one bottleful of a mixture of equal parts of raw linseed oil and lime water. To each bottle of the mixture (Carron oil) 2 tablespoons of tannic acid must be added.

Prevention.

Losses from the above disease can be entirely prevented by providing shelter and adequate food during the winter months.

Very often animals cover miles in search of the few available tufts of more nutritious young grass. In fact, the amount of energy expended in looking for their feed may be greater than the energy gained by the consumption of such feed. The position would be greatly alleviated, however, if the available summer roughages could be put to better use. It would be found profitable to gauge the carrying capacity of the veld by the number of animals carried during the summer months. The procedure would allow of a proper system of rotational grazing and a greater interest in veld conservation. In

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Farming on Small Holdings.

J. J. du Toit, College of Agriculture, Potchefstroom.

MANY people, especially townsmen, cherish the hope of becoming the owner of a small farm. Such a holding is pictured as a real paradise, the foundation of a happy life, away from the bustle of the town. It is remarkable how many town-dwellers have recently acquired plots or small holdings in the vicinity of cities with a view to commencing small-scale farming operations without sacrificing their work in town. Often exorbitant prices are paid for only a morgen of land. Should irrigation water be available in sufficient quantity so that lucerne, vegetables, fruit-trees and flowers can be grown successfully, the potentialities of such holdings are great, but if irrigation cannot be applied the prospects are less bright, unless the holding is relatively extensive, so that fodder crops can be grown on a comparatively large scale under dry-land conditions for cows, fowls and other animals.

Good Water Supply Essential.

In many cases the irrigation water on which hopes are based is obtained from a borehole, the water being pumped into a cement reservoir by means of an engine or wind mill. The general tendency is to overrate the area which can be watered by such a limited supply. Theoretically, one morgen requires 150,000 gallons of water per irrigation, but in practice the quantity is usually much larger. Most crops, especially vegetables, must in times of drought be irrigated at 10 to 14-day intervals, but at such times the borehole and pump plant usually cannot supply more water than is needed for watering the original 1 to 1½ morgen, unless supplementary water becomes available either by way of timely rains or storage water, collected in large reservoirs.

Where only small areas can be irrigated, intensive vegetable, flower and fruit-farming is proving a success, but in those cases where poultry and dairy farming are contemplated the irrigable land could be used mostly for the cultivation of lucerne and the necessary green fodder crops such as oats or barley for winter feeds. If a relatively large area could be irrigated, so that, in addition to lucerne, it would be possible to grow vegetables and annuals the adoption of a system in which lucerne and the other crops are grown in rotation would be advisable for maintaining soil fertility. Half the area under irrigation may, for example, be planted to lucerne and the remaining half to vegetables and the necessary green feeds. After about 5 or 6 years the lucerne land is ploughed and planted to annuals, whilst lucerne in its turn is established on the land previously planted to vegetables. Regular applications of superphosphate and kraal manure or compost and the prevention of soil infestation, with the dreaded eelworm introduced by diseased seed potatoes are important requisites of success in crop-production on small holdings under irrigation.

Dryland Crops.

The prospective intensive farmer who has no irrigation water at his disposal usually concentrates mainly on dairy and poultry farming, and the first question which he usually askes the College of Agriculture is what types of fodder crops he can grow for his cows and other animals under dry-land conditions and what area

of land he should plant to each specific crop. These questions can only be answered if more particulars are supplied as regards the locality, size of the farm, nature of the soil and area which can be ploughed. The feed requirements of all dairy farmers in the summer-rainfall area are more or less the same. In addition to his natural grazing a farmer on the highveld needs at least four different kinds of feed for his cows, namely, (1) a concentrate such as maize; (2) a protein rich feed, such as lucerne, cowpea or soybean hay; (3) a grass hay, such as teff, Sudan grass or millet; and (4) some green or succulent feed, such as oat pasturage, ensilage, or a root crop. The morgenage to be planted to each of these four crops will depend on the number of animals, the particular ration to be fed and the possible yield per morgen which can be expected from each of these crops under normal conditions. A popular ration which usually gives good results in the case of cows yielding about 3 gallons of milk per day is 7 to 8 lb. of maize meal, about 12-15 lb. of legume hay, 5 lb. of teff and about 30 lb. of silage per day.

The following recommendations which are of a more specific nature can be made as regards the fodder crops required by a highveld dairy farmer: (1) the new improved Sahara variety which is a suitable yellow maize type and which is very resistant to drought, answers well even on relatively poor soils and usually produces high yields; (2) the new upright-growing cowpea, No. 361, as a protein-rich hay fodder; (3) Teo maize or else Sahara maize for ensilage; and (4) teff for hay. Under normal conditions yields of 15 to 20 bags of maize, 3 to 4 tons of cowpea hay, 3 tons of teff and 20 tons of silage per morgen can be produced. Thorough weeding and the application of manure and fertilizer will tend to produce higher yields.

If a definite number of cows is taken for calculation purposes the area of land to be planted to each fodder crop can be determined according to the above figures. Assuming, for example, the number of cows to be 30, the annual requirements according to the above ration would be about 383 to 438 bags of maize, 82 tons of legume hay, 27 to 28 tons of teff and 81 tons of silage. These feeds can be harvested from about 25 to 30 morgen of land planted to maize, 21 to 27 morgen planted to cowpeas, 9 to 10 morgen planted to teff and 4 to 5 morgen under maize for ensilage. In short, the feeding of one cow per annum requires the planting of about one morgen of land to maize, one morgen to cowpeas, $\frac{1}{3}$ morgen to teff and $\frac{1}{6}$ morgen to a silage crop. The silage requirements are calculated for 6 months only since this fodder is not essential when green grazing is available.

Should the holding be too small for the production of all feeds required, it will in most cases be more profitable to plant the available land mostly to cowpeas and other roughage and to buy the maize required since the former fodder crops are relatively more expensive and less readily available than maize.

To Clean Playing Cards.—Rub them with a piece of butter on a clean flannel cloth; then polish with another flannel cloth dipped into dry flour. After this treatment the cards will have the appearance of a new pack.

Moths in a Carpet.—If moths have got into a carpet, the best plan is to spread a damp towel over the affected part and to press it with a hot iron until dry. It is not necessary to press hard, as the heat and steam will destroy both moths and eggs.

A Sheep-Grazing Experiment on Natural Veld at Glen.

J. J. Morris, Pasture Research Officer, College of Agriculture, Potchefstroom.

WHERE sheep farming alone has been practised, the effect on the grass veld has not been very favourable, especially in areas with a low rainfall. Where grass veld has deteriorated in this manner, it can, to a certain degree, be attributed to injudicious grazing systems or even to the absence of such systems. Sheep

Sheep on good natural grazing. [Photo *The Farmer's Weekly*.

have a more detrimental effect on the veld than cattle, as they graze much shorter and more selectively. This is one of the causes of the occurrence and increase of unwanted encroaching plants, such as steekgras, bitterbos, vaalkarroo and even a poisonous plant such as vermeerbos.

It is, however, an encouraging fact that farmers in such areas are going in more and more for cattle-farming and that sheep are being regarded as only supplementary to cattle-farming. Several such cases are known and in every case a considerable improvement is to be noticed in the veld.

The following experiment was conducted at the Glen College of Agriculture, which is in a low-rainfall area, from 1937 to 1944 to determine the effect on grass veld of sheep grazing under a controlled system.

Various periods of grazing, alternated with various periods of

rest, were compared with continuous grazing.

Types of grass.—At this institution the veld is characterized by a climax type of red grass (*Themeda triandra*), chiefly supplemented by a small sweet grass (*Eragrostis lehmanniana*) and, to a lesser degree, by other *Eragrostis* types, finger grass, cotton grass, *Setaria* species and others. Pioneer types, such as steekgras (*Aristida congesta*) and wortelsaadgras (*Tragus koeleroides*), frequently appear on damaged veld and on bare patches.

Rainfall.—The average annual rainfall during the 7 years in which the experiment was conducted, was somewhat higher than the average rainfall for the past 26 years. The following is the average annual rainfall for the 7 years (1937-43), viz.

1937 (21·37 ins.), 1938 (13·96 ins.), 1939 (19·45 ins.), 1940 (25·88 ins.), 1941 (23·89 ins.), 1942 (17·14 ins.) and 1943 (38·49 ins.).

The average yearly rainfall for the 7 years (1937-43) was 22·9 ins.

The average yearly rainfall for the 25 years (1915-42) was 19·8 ins.

The average yearly rainfall for the 26 years (1915-43) was 20·5 ins.

It will be noted that the rainfall during 1943, viz. 38·49 ins., which was the highest for the past quarter of a century, considerably increased the yearly rainfall figure.

During the period under review, there were 5 precipitations of 2 inches or more within 24 hours, viz.

1939—19 October: 3·20 ins.
1940— 8 November: 2·58 ins.
1940— 9 November: 2·53 ins.
1941— 4 February: 2·39 ins.
1943—12 October: 2·20 ins.

Outline of Experiment.

Eight morgen of natural veld, representative of the area, was divided into 4 paddocks of 2 morgen each. The following treatment was applied to the four paddocks:—

Paddock 1.—Letting 12 sheep graze on it for *one month* and resting it for *three months*, so that the paddock was grazed for 3 months and rested for 9 months during the year.

Paddock 2.—Letting 6 sheep graze on it for *two months* and resting it for *two months*, so that the paddock was grazed for 6 months and rested for 6 months during the year.

Paddock 3.—Letting 4 sheep graze on it for *three months* and resting it for one month, so that the paddock was grazed for 9 months and rested for three months.

Paddock 4.—Letting 3 sheep graze on it continuously.

This four-month cycle of grazing and resting was begun annually in spring after the first rains during the growing season, about the beginning or the middle of October. The grazing and resting periods were thus as follows in the various paddocks:—

Paddock 1:
1 month grazing and 3 months rest during *early summer*.
1 month grazing and 3 months rest during *late summer*.
1 month grazing and 3 months rest during *winter*.

Paddock 2:
2 months grazing and 2 months rest during *early summer*.
2 months grazing and 2 months rest during *late summer*.
2 months grazing and 2 months rest during *winter*.

Paddock 3:

3 months grazing and 1 month rest during *early summer.*
3 months grazing and 1 month rest during *late summer.*
3 months grazing and 1 month rest during *winter.*

Paddock 4:

Continuously grazed during early summer, late summer and winter.

Although a carrying-capacity of 1·5 sheep per morgen per year was decided on, it was not always possible to attain this figure or even to keep the number of grazing days per year the same in the four paddocks. Due to varying climatic conditions, it is practically impossible to determine the carrying-capacity and the number of animal grazing days mathematically. This matter, however, is discussed further under " carrying-capacity ".

Changes in the Vegetal Cover, 1937-44.

As far as the most important types of grass appearing on the experiment area are concerned, the following conclusions can be drawn at the end of the 7-year period.

Red grass (*Themeda triandra*).—This grass is regarded as one of the most important types of the veld. After the seven years a relatively large decrease was noticed in all the paddocks, except in paddock 1, where there was a slight increase and spreading. This type of grass decreased more and more in paddocks 2, 3 and 4, respectively. The observations, however, indicated that short concentrated grazing, followed by relatively long periods of rest, had a favourable effect on the veld.

Small sweetgrass (*Erasgrostis lehmanniana*).—This type of grass is also regarded as good grazing, especially in the young stage. After the seven years a decrease was noticed in all four paddocks, although considerably more in paddocks 2, 3 and 4 than in paddock 1. This phenomenon also indicates that short heavy grazing, followed by a good period of rest, influences the veld favourably.

Eragrostis sp.—This is not such a palatable type of grass as the former *Eragrostis* type. The prevalence remained more or less the same in all four paddocks during the 7 years' grazing.

White steekgras (*Aristida congesta*).—This grass is regarded as a pioneer type, and its considerable prevalence is a good indication of the effect which the various grazings had on the veld.

This relatively worthless steekgras showed a considerable increase in paddocks 3 and 4 in comparison with paddocks 1 and 2, and the steekgras occurring in paddocks 1 and 2 was found mixed with better types of grass such as small sweetgrass and red grass.

Wortelsaadgras (*Tragus koeleroides*).—This is also a pioneer type and its greatest value lies in the fact that it covers bare ground just like steekgras. It is a flat runner type, and as far as grazing is concerned, it is not of much value, as even sheep cannot find much to eat on it. Over the period of 7 years it also showed the same greater increase in paddocks 3 and 4.

Enneapogon sp.—This type of grass is usually found on limy soils, and as far as sheep grazing is concerned, it is not of much value. In part of paddock 4 a considerable amount of this type was found, and the phenomenon must to a certain extent be regarded as the result of selective grazing.

Other grasses which occur to a lesser degree and of which changes in density were not actually noticed, were e.g.—

Digitaria sp. (finger type of grass), weeluissaadgras (*Eragrostis superba*), douvatgras (*Eragrostis obtusa*), *Setaria* sp., lime grass (*Fingeruthia* sp.), tea sugar grass (*Aristida vestida*) turpentine grass (*Cymbopogon porinodes*) and kweekgras (*Cynodon decatylon*).

Encroaching Plants.

This term is used to indicate plants which are mostly unwanted and which as a result of bad control encroach on the better types, so that the presence of encroaching plants is always an indication of damaged veld.

A few of these encroaching plants were found in the experiment paddocks, e.g., steekgras, springbokbos (*Othonna pallens*) kriedoring (*Lycium* sp.) *Helichrysum* sp., meercat or vaalkarroo and bitterbos (*Chrysocoma tenuifolia*). These encroaching plants were more noticeable in paddocks 2, 3 and 4, especially the last two, so that it may be concluded that the damage by sheep-grazing was more severe in paddocks 3 and 4.

Carrying-capacity.

At the beginning of the experiment the carrying-capacity of the veld was taken as 1·5 sheep per morgen per year. The various concentrations of sheep for the various grazing periods were arranged so that the four paddocks received exactly the same number of grazing days during the year. Due to highly varying climatic conditions, however, it was impossible to carry out this fixed procedure in practice. It was found, for instance, that 1½ sheep per morgen could only be carried for 1 year out of the 7 (1939) in the four paddocks; and the four paddocks could carry approximately the same number of sheep per morgen per year for only 3 out of the 7 years. Neither could paddock 4 carry the 4 sheep continuously, except during 1939, when 3 sheep were kept in the paddock for the full 12 months. The average number of sheep per morgen per year which the four paddocks carried during the 7 years, was as follows:—

Paddock 1 : 1·21 sheep; Paddock 2 : 1·16 sheep; Paddock 3 : 1·16 sheep an Paddock 4 : 1·14 sheep. Paddock 1, the carrying-capacity of which was highest, viz. 1·2 sheep per morgen per year, was least damaged at the end of the 7 years. These data indicate that the grazing system which was followed in paddock 1, viz. 1 month grazing and 3 months rest, is very favourable.

From these data concerning the carrying-capacity, it can be assumed that under a reasonably favourable system of grazing and resting, such as was carried out in paddock 1, this veld can hardly carry an average of 1·2 sheep per morgen per year without damage to the veld. Under less favourable grazing systems, such as were carried out in paddocks 2, 3 and 4, the carrying-capacity was lower and the damage to the veld greater.

Conclusions.

1. None of the grazing systems brought about the desired or expected veld improvement with sheep-grazing alone.
2. The carrying-capacity of the particular veld, viz. 1½ sheep per morgen per year, was probably overestimated, as appears from the final experiment results. A carrying-capacity of 1·2 sheep per morgen per year, under a reasonably favourable system of grazing, which does not damage the veld, seems to be more practical. Under less favourable grazing systems, as well as continuous grazing, the carrying-capacity is lower and the veld damage greater.
3. Of all the various grazing systems it appears that a high concentration of sheep for a short period, followed by a relatively long period of rest, as in paddock 1, causes least damage to the veld, and at the same time gives the highest carrying-capacity.
4. The longer the grazing period, followed by shorter intervals of rest, even with a smaller concentration of sheep, the more detrimental is the effect on the veld and the lower is the carrying-capacity.

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Studies on Merino-Wool Production.

The Return per Sheep as Opposed to the Price per Pound of Wool.

Dr. V. Bosman, Senior Wool Research Officer, Onderstepoort.

IT is contended that, in the post-war textile market, wool will be in competition with other fibres, and very largely on a price basis—a threat which cannot be ignored by the wool producer.

To-day, more than ever before, the economics of wool production must be studied by the producer. Foremost among the topics for attention is the necessity for producing the most profitable fleece.

Generally speaking, the most profitable fleece is one where both the characteristics of quality and quantity of wool are exaggerated, but the question of specifying the fleece in relation to its market value, and ultimately as the monetary return to the wool farmer, has not received the attention it deserves. It has been observed that many farmers are satisfied with a high price per pound of wool without scrutinising the monetary returns received per sheep. In many cases the high price per pound of wool when coupled with a small fleece, constitutes an uneconomic basis of production.

A few facts as they are revealed by the research work now in progress are here discussed.

The Wool Income.

The farmer's wool income depends on the number of sheep that are shorn, as well as on the income from each sheep. The number of sheep shorn is more or less controlled by the carrying capacity of the farm, but the income from the wool per sheep is a variable factor depending on the detailed virtues of the fleece.

It has been shown to what extent the factors of wool length, number of fibres growing per square inch of skin, fibre thickness and size of skin area of the animal control the quantity of the wool in the fleece. For instance, a well-grown merino ewe possessing a fleece that has a 2½-inch staple length (for 12 months' growth), 20,000 fibres per square inch of skin and a wool of a 64's quality number would produce about 2¼ lb. of clean scoured wool (or about 5¾ lb. of greasy fleece).

If such a ewe could produce a 3½ inch staple length (in 12 months) it would now give 3¼ lb. of clean scoured wool (or about 8 lb. greasy fleece).

If the latter ewe could, instead of producing 20,000 fibres per square inch, possess, say, 30,000 fibres per square inch of skin, the ewe would give 5 lb. of clean scoured wool (or over 11 lb. of greasy fleece).

Comparisons such as these have made it possible to formulate underlying principles in wool production and, since the market prices are fixed for different grades of wool, it is possible to assess the returns obtained from different types of fleeces. This directly concerns the topic of returns per sheep as opposed to the price per pound of wool.

The Returns per Sheep Constitute Sound Policy.

The question has often been asked whether those farmers who obtain, say, 20 pence per pound of wool are better or worse off than those obtaining, say, 15 pence per pound. The position needs analysing, and comparisons of some cases are given in table form.

A well-grown type of flock ewe with different staple lengths, quality numbers and number of fibres growing per square inch of skin is analysed for fleece weights, both clean and greasy (assumed with 52 per cent. yield), price per pound of wool (clean and greasy) and also the total returns per sheep.

Wide differences in the returns per sheep are evident and these depend on the staple length, number of fibres per square inch of skin, quality number of wool and the price paid per pound of wool. It is shown that flock ewes can return anything from 2s. 11d. to 12s. 8d. per sheep, depending on these factors.

TABLE: *Comparison of different types of fleeces and their monetary values for well-grown flock ewes*.*

Example No.	Staple length (with normal crimping).	Quality No.	No. fibres per square inch of skin.	Fleece Weights (lb.).		Price per lb. (pence).		Return per sheep (Shillings and pence).
				Clean.	Greasy (Assumed 52 per cent. yield).	Clean.	Greasy (52 per cent. yield).	s. d.
1	3½ inch...	70's	15,000	2·0	3·8	36¾	19	6 3
2		70's	20,000	2·7	5·2	36¾	19	8 4
3		70's	25,000	3·4	6·5	36¾	19	10 5
4		60/64's	15,000	2·7	5·2	33¼	17¼	7 7
5		60/64's	20,000	3·7	7·1	33¼	17¼	10 2
6		60/64's	25,000	4·6	8·8	33¼	17¼	12 8
7	2¾ inch...	70's	15,000	1·6	3·0	38¾	20¼	5 2
8		70's	20,000	2·1	4·0	38¾	20¼	6 11
9		70's	25,000	2·7	5·2	38¾	20¼	8 8
10		60/64's	15,000	2·2	4·2	32½	17	5 10
11		60/64's	20,000	2·9	5·6	32½	17	7 9
12		60/64's	25,000	3·6	6·9	32½	17	9 9
13	2¼ inch...	70's	15,000	1·3	2·5	36¾	19	4 0
14		70's	20,000	1·8	3·5	36¾	19	5 4
15		70's	25,000	2·2	4·2	36¾	19	6 8
16		60/64's	15,000	1·8	3·5	30¼	15¾	4 5
17		60/64's	20,000	2·4	4·6	30¼	15¾	5 11
18		60/64's	25,000	2·9	5·6	30¼	15¾	7 5
19	1¾ inch...	70's	15,000	1·1	2·1	31½	16¼	2 11
20		70's	20,000	1·4	2·7	31½	16¼	3 8
21		70's	25,000	1·8	3·5	31½	16¼	4 9
22		60/64's	15,000	1·4	2·7	27¾	14¼	3 3
23		60/64's	20,000	1·8	3·5	27¾	14¼	4 2
24		60/64's	25,000	2·3	4·4	27¾	14¼	5 4

It is also clear that a high price per pound does not necessarily mean a good return per sheep. Examples are quoted: Sheep producing 60-64's quality wool with 2¾ inch staple length (example No. 11) fetching 17 pence per pound, could actually bring in more money (7s. 9d.) than sheep producing a 70's wool and fetching 20¼ pence per pound, the latter giving 6s. 11d. per sheep (example No. 8). Such a difference means over £40 per 1,000 sheep. A comparison between examples Nos. 7 and 6 shows that although No. 7 obtains 20¼ pence per pound with 5s. 2d. per sheep, No. 6 with only 17¼ pence per pound obtains 12s. 8d. per sheep, a difference of about £375 per 1,000 sheep.

From the table many comparisons are possible which show that the return per sheep depends on factors other than the price per pound of wool.

* It has been shown that flock ewes usually have a fleece density of from 15,000 to 25,000 fibres per square inch of skin, and the calculations in the table are based on theoretical considerations which have been practically demonstrated from the many examples of fleeces tested for wool farmers.

Sound Selection and Breeding Methods.

In sheep selection and flock culling, the retention in the flock of the most payable types of fleeces would ensure the most profitable wool cheque. Such fleeces should be characterized by a good length (for the 12 months) and by a good fleece density. It is also obvious that a very fine-fibred wool is not, according to present market prices, a paying proposition and the price paid per pound for such wool does not warrant its production where it is possible for the farmer to produce the coarser type.

The retention of the most profitable wool producers alone would not ensure continued profitable wool cheques, but this must be coupled with the use of the right type of ram that transmits the desired characteristics to its progeny. It has been shown in a previous article * that the prepotency of desired characteristics in the ram has a far greater influence on the progeny of the breeding stock than has sheep selection and flock culling as such.

Other Aspects.

The financial success or otherwise of merino-sheep farming, although greatly controlled by the production of the most profitable fleeces, does not depend entirely on the fleece. The advantages of large lamb crops, healthy well-grown sheep and minimum mortality are essential to economic wool farming. It is these that greatly assist in the lowering of the costs of production so as to enable the wool farmer to sell his wool on a competitive price basis on the world's textile markets.

Summary and Conclusion.

Since price competition with other textile fibres in a post-war market calls for the production of the most profitable fleeces, an analysis is given of the return per sheep as opposed to the price per pound of wool. It is shown that a high price per pound of wool is not necessarily the basis for profitable fleece production and farmers are urged to give attention to the returns per sheep rather than to a high price per pound of wool.

* Studies on Merino Wool Production. Fleece tests on Stud Sheep, V. Bosman, *Farming in South Africa*, November 1943.

A Sheep-grazing Experiment on Natural Veld at Glen:—

[*Continued from page 594.*

With continuous grazing the maximum damage is caused and the carrying-capacity is lowest.

5. The experiment results do not offer any solution to the steekgras problem—not even the results of the best of the four grazing systems, where sheep-grazing alone was applied. The relatively high occurrence of steekgras in the experiment paddocks, in comparison with the adjoining cattle camps, was very marked.

6. With sheep-grazing alone, a large degree of selective grazing takes place. As a result, unwanted encroaching plants predominate over the better and more palatable types of grass.

7. The solution to this problem in the grass veld of the low rainfall areas seems to lie in the partial or total replacement of cattle-farming by sheep-farming, provided a sound system of grazing is followed.

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

Cooking of Cereals.

Miss S. Snyman, Home Economics Officer, Department of Agriculture and Forestry.

SINCE cereals as a regulating and body-building food are such an important factor in a balanced diet and are served day by day in some form or other, a thorough knowledge of their preparation is essential.

Cereals are obtainable in so many forms that the housewife can, by serving them, introduce much variety in the menu.

The coarsely-ground product contains more iron and phosphorus than the refined product. Although cereals are no reliable sources of calcium and proteins, these nutrients can be supplemented by using milk and other products in conjunction with the cereal to obtain a better-balanced diet.

The cereal which is served for breakfast in the form of porridge has become such a common food, that its preparation no longer requires special thought. This course often forms the main breakfast dish and should thus be well-prepared and appetizing.

Modern manufacturing methods have rendered it possible to obtain cereals commercially in either cooked or partly-cooked form. Partly-cooked oats and wheat, for example, are sold in packets, and many manufactured foods need only be warmed for a few minutes before serving.

Cereals consist of starchy material contained in a network of proteins and are protected by various layers of fibrous substance known as bran or cellulose.

In manufacturing cereals these outer bran layers are removed either entirely or partly.

Coarsely ground cereals, i.e those retaining the greater portion of the bran, should be cooked longer than the refined product. The cooking process may be shortened by first soaking the cereal.

The refined product, which contains little bran, absorbs more water than the coarsely-ground one. The duration of the cooking process will thus be determined by the coarseness of the cereal. This implies that a refined cereal will use relatively more water than the coarsely-ground product, although it will need a shorter cooking time.

Thorough cooking of cereals is essential since the cellulose or bran does not readily soften, and prolonged boiling improves the flavour of the starch.

The Cooking Process.

In cooking cereals two important aspects must be borne in mind. First, the quantity of water added should be sufficient to allow of swelling and soaking, secondly, the boiling should be continued sufficiently long to ensure improvement of flavour and taste.

Cereals may be cooked either by the direct application of heat or by steaming in a double cooker. Naturally, the application of direct heat is the quicker method, but this method demands more attention, since the cereal has to be stirred every now and then to avoid burning. Since prolonged boiling improves the taste and softens the cellulose more thoroughly, the use of a double cooker is recommended.

Cereal foods which are boiled by the application of direct heat, are slowly added to boiling salted water and heated until the product thickens. The heat is then reduced and the porridge allowed to boil slowly for the remainder of the time. To prevent the formation of lumps the meal should first be mixed with a little cold water or milk before it is added to the boiling salted water. If a double cooker is used there is no need for stirring continually, since the porridge will not burn.

As regards the consistency of porridge various views are held. The quantities of water given below represent averages which can be changed according to individual taste.

For 1 cup of mealie meal use 5-6 cups of water which will give about 5 cups of porridge.

For 1 cup of oatmeal use 4-5 cups of water which will give about 4 cups of porridge.

For 1 cup of rolled oats use 4-5 cups of water which will give about 4 cups of porridge.

For one cup of kaffircorn meal use 7-8 cups of water which will give about 7 cups of porridge.

For 1 cup of soybean meal use 4 cups of water which give about 3½ cups of porridge.

Cereals may be boiled in milk instead of in water, or a proportion of the water may be replaced by milk. This will increase the nutritional value of the cereal.

A safe rule for determining the quantity of salt to be added, is to take 1 teaspoonful to every 4 cups of water.

Since prolonged slow boiling has the effect of considerably improving the taste, cereals which have not been soaked beforehand can be boiled from 4 to 5 hours, whilst others which have been soaked overnight or for a few hours in sufficient cold water can be boiled for 2 to 3 hours.

In the case of manufactured cereals, the boiling period is much shorter, although extra boiling usually improves all cereals.

Variation in Meals.

If porridge is cooked in the evening for breakfast the following day, it may be allowed to cool off by standing the cooker in a pot of cold water and re-heating it in the morning. It is well not to stir the porridge in the morning until it is thoroughly hot, because if it is stirred while still cold, lumps will be formed which are difficult to remove. To prevent the formation of a film on top of the porridge, two to three tablespoonfuls of water may be poured over it after the boiling process at night. In order to introduce variation, dried fruit can be added immediately before the porridge is served. Fresh or canned fruit can also be served.

Cereals are an important food on the breakfast table and play an equally important rôle on the dinner table as samp, mealie-rice, crushed kaffircorn and wheat.

If the nutritional value of maize and wheat is taken into account these foods can be regarded as economical and by using

them in the form of various dishes, the housewife can introduce variety in the menu.

Delicious dishes of crushed wheat or samp may be prepared as follows:—

Take half a cup of samp or 1 cup of crushed wheat, soak it overnight in cold water. Boil it the next morning in 2½ cupfuls of boiling water to which ½ tablespoonful of salt has been added. Allow to steam until the cereal is soft. Mealie rice is another form in which maize can be served. In this case 1 cupful of rice is taken to 4 cupfuls of water. The cereal is then steamed for 2 hours or until it is soft.

Even in the preparation of puddings cereals may be used. Remove the cores of apples and place the fruit in a greased baking dish, filling the openings with a cooked cereal. Cover the apples with a ¼ cupful of brown sugar and place a little butter on the apples so filled. Bake in a moderate oven for half an hour.

Instead of apples, quinces may be used. Wash the quinces and remove the core. Boil the quinces until soft in a syrup prepared from 1 cup of sugar and 1½ cups of water. Take the quinces out of the syrup, place them in a baking dish and fill them with a cooked cereal; pour some syrup on the quinces; bake the fruit in a moderate oven until it is quite tender.

Mealie rice, too, can be converted into a pudding. Mix 1½ cups boiled mealie rice with 1 cup of milk, 1 well beaten egg, 2 tablespoonfuls of brown sugar and ½ tablespoonful of vanilla. Pour the mixture in a well-greased baking dish. Place cubes of butter on top. A little grated nutmeg will improve the taste. Bake for 30 minutes in a moderate oven.

Since there are such a large variety of cereals on the market, a supply of each may be kept on hand so that a variation in the menu may be introduced at any time.

The cereals should always be stored in a dry place in order to prevent their turning rancid or from being infested with mite. Coarsely-ground cereals are more subject to spoilage than the refined products. Consequently cereals should regularly be stored in tight holders.

Inexpensive Hot Puddings.

Miss S. J. A. van Schalkwyk, Home Economics Officer,
Department of Agriculture and Forestry.

NOT only does a dessert serve to finish off a meal, but it can also be included in the menu to supplement and balance meals. When vegetables are scarce, a dried fruit pudding can take their place, and such a dessert is always welcome, even if it consists only of steamed dried fruit with custard. The most important mineral salts in dried fruit are calcium, phosphorus and iron. They are essential constituents for maintaining health and promoting the working of the body-processes. Dried fruit also contains sugar in an easily digestible form. A large variety of baked and steamed puddings, such as given in a few of the following recipes can be made with dried fruit.

Types of Puddings.

Left-over vegetables, such as pumpkin, potatoes or sweet potatoes, and even porridge, can be used in interesting ways in puddings, such as pumpkin fritters, mealie-meal pancakes or baked

mealie-meal custard. Crumbs from the cake or biscuit barrel can form the basis of many a tasty baked pudding.

Steamed puddings are always popular and often a boon to the housewife who must prepare a variety of dishes. A number of puddings can be prepared beforehand and kept in the moulds, even for a few weeks. The pudding is then just steamed for half an hour before being served.

The dough-mixture for steamed puddings must be fairly stiff so that the fruit will not settle at the bottom. The buttered tins or moulds must only be filled two-thirds to allow for the rising of the pudding. Butter the lid well on the inside with butter or fat and see that it fits tightly on the tin or mould. If the puddings are steamed in a saucepan with boiling water, the moulds must be only two-thirds under water. Keep the lid of the saucepan well down and add boiling water when it becomes necessary to supplement the water in the saucepan.

To remove steamed puddings whole from the moulds, a damp cloth is wrapped round the tin; slightly loosen the sides with a knife, turn over the mould, but do not shake the tin, for the weight of the pudding will draw it out.

A sauce with steamed and baked puddings can usually add to the flavour and attractiveness of the dessert. A rich sauce, such as a caramel sauce, is made with plain puddings, for it is not necessary to supplement a pudding with a rich sauce if it already contains a lot of butter, sugar, fruit or nuts. In this case use is rather made of a lemon sauce.

Recipes.

(*N.B.*—T. stands for tablespoon; tsp. for teaspoon; c. for cup.)

DRIED FRUIT SOUFFLÉ.

¾ c. dried apricots or prunes.	¼ c. sugar.
2 T. lemon juice.	3 eggs.

1. Thoroughly mash the fruit.
2. Soak overnight in water and boil in the same water until soft.
3. Force fruit through a coarse sieve.
4. Add sugar and lemon juice.
5. Fold in the stiffly beaten whites of five eggs.
6. Pour mixture in a buttered dish and bake in a slow oven for 30 minutes.
7. Serve with custard made from the yolks of the eggs, 1½ c. milk and 3 T. sugar.

DRIED FRUIT ROLL.

2 c. flour.	4 tsp. baking powder.
2 T. sugar.	2 T. butter.
½ tsp. salt.	2 eggs.
Milk or water to make a dough.	½ c. seeded raisins.
½ c. dried figs.	

1. Wash the figs, soak for a few hours and boil until soft.
2. Drain off, add to the raisins and mince together.
3. Add the lemon juice and, while stirring, boil on the stove until the fruit becomes stiff.
4. Sift the dry ingredients together, rub the butter in, add to the well-beaten eggs and enough milk or water to form a dough which can be rolled out.
5. Roll out the dough to a thickness of about half an inch, spread fruit over it, roll in the shape of a jelly-roll and place in a buttered dish.
6. Pour the following sauce over it:—

1 c. water.	2 T. jam.
a pinch of salt.	2 T. butter.
½ c. honey.	2 T. sugar.
1 tsp. vanilla essence.	

Bake in an open dish in a moderate oven.

PRUNE-PUDDING WITH ORANGE SAUCE.

½ lb. prunes.	2 eggs.
A little grated orange rind.	2 c. diluted sweetened condensed milk.
1 c. dry bread crumbs.	

1. Soak the prunes in enough water to cover them.
2. Remove the pips and thinly slice the fruit.
3. Add to the bread crumbs which have been soaked, in the condensed milk.
4. Add the grated orange rind and the well-beaten eggs.
5. Place in a buttered mould or tin and steam for 1½ hours.
6. Serve with the orange sauce.

Orange Sauce.

2 T. sweet jam.
1 tsp. maizena.
a pinch of salt.
½ c. orange juice.
½ c. water in which the prunes have been soaked.

Mix all the ingredients and boil for 2 minutes or until the maizena is cooked.

BROWN APPLE PUDDING WITH LEMON SAUCE.

½ lb. apple rings, or 6 apples, thinly sliced.
2 c. soft bread crumbs.
½ T. ground cinnamon.
3 T. butter.
¾ c. sugar.
½ T. ground cloves.
1 c. seeded raisins.

1. Wash the apple rings and soak overnight.
2. Place a layer in the bottom of a buttered dish.
3. Mix the sugar and spices.
4. Sprinkle some of this mixture over the apple rings in the dish.
5. Place a layer of bread crumbs and raisins on top, with a few lumps of butter distributed all over.
6. Repeat the layers until all the ingredients have been used; the last layer must be one of bread crumbs with the sugar mixture and pieces of butter on top.
7. Bake in a hot oven for 45 minutes with the lid on.
8. Remove the lid and leave in the oven for a few minutes to brown on top.

Lemon Sauce.

½ c. sugar.
1 T. maizena or meal.
2 T. lemon juice.
a pinch of salt.
2 T. butter.
1 c. boiling water.
a little grated nutmeg.

1. Mix sugar and meal thoroughly.
2. Add boiling water and salt and boil until thick and clear.
3. Boil for another 5 minutes.
4. Remove from the stove and add butter, lemon juice and nutmeg.

Grated lemon rind may also be added.

STEAMED FRUIT-PUDDING.

3 T. butter (melted).
½ c. syrup or honey.
½ c. milk.
1 egg.
1½ c. meal.
½ tsp. bicarbonate of soda.
½ tsp. salt.
1 c. seeded raisins or any cooked dried fruit.

1. Mix the dry ingredients.
2. Add to the mixture of butter, syrup, milk and egg.
3. Mix well and add the fruit.
4. Steam in a buttered tin or mould for 2½ hours.

Serve with a caramel sauce.

SPICE PUDDING.

1 c. seeded raisins.
1 egg.
½ c. sugar.
2 c. milk.
1½ c. fresh bread crumbs.
1 tsp. cinnamon.
½ tsp. ground cloves.
½ tsp. grated nutmeg.
a pinch of salt.
1 tsp. melted butter.

1. Beat the egg and sugar together.
2. Add milk and pour mixture over the crumbs.
3. Cut up the raisins and add to the previous mixture.
4. Mix the rest of the ingredients and add.
5. Mix thoroughly and bake in a moderate oven until stiff.
6. Serve with any sauce.

VEGETABLE PUDDING.

1 c. sugar.
1 c. meal.
2 tsp. baking powder.
1 tsp. salt.
1 tsp. bicarbonate of soda.
1 c. grated raw carrots.
1 c. grated raw potatoes.
1 c. seeded raisins.

1. Sift meal, sugar, baking powder, salt and bicarbonate of soda together.

2. Add the other ingredients and mix well.
3. Steam for 2 hours.
4. Serve with a hot sauce, e.g., wine sauce.

PUMPKIN FRITTERS.

2 c. mashed cooked sweet pumpkin.
2 tsp. baking powder.
Enough meal to bind.
1 egg.
a pinch of salt.

Mix the ingredients well and drop spoonfuls into a hot pan with melted butter or fat. Fry on both sides and sprinkle with cinnamon sugar.

MEALIE-MEAL PORRIDGE PANCAKES.

1 c. mealie-meal porridge.
1 tsp. bicarbonate of soda.
a pinch of salt.
½ c. sour milk.
1 T. sugar.
½ tsp. grated lemon rind.

Mix the ingredients well and drop spoonfuls into a hot pan with melted butter or fat. Fry on both sides until light brown and serve like crumpets with butter, syrup or honey.

MEALIE-MEAL PORRIDGE CUSTARD.

1 c. mealie-meal porridge.
⅓ c. sugar.
1 tsp. vanilla essence.
1 c. milk.
2 eggs, beaten.
a pinch of salt.

1. Dilute the porridge with milk.
2. Add the remaining ingredients.
3. Pour the mixture in a buttered dish, grate a little nutmeg over it and place a few pieces of butter on top.
4. Bake for 1 hour in a moderate oven.
5. Serve with any preserve syrup such as that of fig or water-lemon preserve.

ECONOMICAL PUDDING.

Cake crumbs (rusk crumbs may also be used).
milk.
egg.
sugar.
meal.
baking powder.

1. Soak the crumbs in milk until soft.
2. Press fine with a fork.
3. Use 1 egg and 1 tsp. baking powder for every 1½ c. mixture. Add the beaten egg and baking powder.
4. Add sugar to taste.
5. Pour in a buttered dish and bake in a moderate oven for 20 minutes. Serve with custard or any pudding sauce.

STEAMED PLUM PUDDING.

½ c. butter.
3 well-beaten eggs.
1 c. nuts.
4 c. boer meal.
½ tsp. salt.
1 c. stewed prunes.
1 c. sugar.
½ c. seeded raisins.
½ c. currants.
4 tsp. baking powder.
1 tsp. cinnamon.
½ c. milk.

1. Cream the butter and add the sugar and well-beaten eggs.
2. Sift the dry ingredients together.
3. Add 1 c. of this to the fruit, and the rest to the sugar and butter mixture alternately with the milk.
4. Mix the fruit with the mixture.
5. Put in a buttered dish and steam for 3 hours.
6. Serve with a wine or brandy sauce.

Brandy Sauce.

½ c. butter.
1 c. fine sugar.
2 T. brandy.
2 eggs.
½ c. milk.

1. Beat the butter and sugar until creamy.
2. Add the brandy slowly.
3. Beat the egg-yolks well and add slowly.
4. Heat over boiling water until it begins to thicken like custard.
5. Pour it into the stiffly-beaten whites of the eggs.

Wine Sauce.

1 egg. ½ c. sugar.
1 T. butter. 1 c. sweet wine.
1 stick of cinnamon.

1. Mix the beaten egg with the sugar and butter.
2. Add the wine and cinnamon.
3. Stir over boiling water or a slow flame until it begins to thicken.
4. Remove the cinnamon and serve.

Caramel Sauce.

1 c. sugar. 1 c. boiling water.
1 T. butter. 1 T. meal.
1 tsp. vinalla essence.

1. Place the sugar and 1 T. water in a frying-pan and stir continuously on the stove until it forms a light brown syrup.
2. Add the boiling water and stir well.
3. Dissolve the meal in a little cold water and stir it in slowly.
4. Let it boil for 1 minute, stirring all the time.
5. Add the butter and when melted the sauce will be ready.
6. When the sauce has cooled off slightly, the vanilla essence is added. Serve hot or cold.

Hints for Housewives.

Piano Keys.—Damp a soft cloth with alcohol and wipe the keys along the grain. Dry with a soft linen cloth. If the keys have become yellow, rub them gently with fine sandpaper, or cover them with a thick paste made of lemon juice and whiting. The paste should be left on for a few minutes, and then washed off with a soft cloth, wrung out of warm water. Polish with a little sweet oil applied with a soft duster, and rub until all trace of oil has disappeared.

Use Of Tea Leaves.—Tea leaves can be put to various uses in the house. They can be sprinkled over carpets and so help to collect and fix dust. If tea leaves which have been kept for several days are infused with boiling water and then strained, they make a useful polish for mirrors, windows, glasses, varnished wood and furniture. Boiled up in a fish pan, tea leaves will also remove the smell.

Dry and Wet Gallsickness:—

[*Continued from page* 588.

addition, stacks of young veld grass should be built at conveniently situated spots where animals may find water and shelter. Mealie stalks may be put to better use by stacking them as well. If this is done, it will be found that animals feed around the stacks and actually thrive fairly well, the main reason probably being that exercise is considerably curtailed.

Various varieties of legumes, such as beans, thrive well in the mealie belt. The hay from such plants, if mixed with veld or other hay and fed in conjunction with mealies, would prove suitable for production. Details concerning the growing of summer and winter feeds for stock are obtainable from The Chief, Division of Animal and Crop Production, Union Buildings, Pretoria, and the Chief, Division of Veld and Soil Conservation, Steyn's Building, Pretoria.

Nursery Quarantines.

The following nursery quarantines were in force on 1 August 1944:—

Parktown North Nurseries, 167-169 Jan Smuts Avenue, Parktown North, Johannesburg, for pernicious scale on pyracantha and mixed deciduous (part) trees.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 23 SEPTEMBER 1944 No. 265

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*Price Review for July 1944.

Grain and Hay.—Large quantities of maize arrived during the month, but the demand was relatively weak. Kaffircorn remained on a stable although lower level than that of the previous month. K1 and K2 averaged 16s. 2d. per bag free-on-rail as against 16s. 10d. per bag for June. Prices of dry beans were also somewhat lower, although offerings were smaller than those of the previous month. On the Johannesburg market speckled sugar beans declined from 96s. 1d. per bag in June to 92s. 3d. in July, and kidney beans from 78s. 10d. to 64s. 8d. Cowpeas were unchanged at 42s. per bag. Cape lucerne hay and teff grass were relatively plentiful but were mostly of inferior quality and prices consequently receded slightly. On the Johannesburg market Cape lucerne hay averaged 5s. 9d. per 100 lb. for the month, and teff 4s. 7d. per 100 lb.

Potatoes.—The serious shortage of potatoes continued while the quality in general also weakened. National mark qualities were exceptionally scarce. The maximum fixed prices were again realized in most cases. New fixed maximum prices came into effect on 11 August 1944. For particulars in this connection see the short article elsewhere in this issue.

Onions.—Supplies still consisted largely of Cape onions, and consignments were somewhat smaller than those of the previous month. Prices remained more or less unchanged. Cape onions averaged 21s. 6d. per bag on the Johannesburg market; 18s. 6d. on the Cape Town market; and 23s. 11d. on the Durban market.

Tomatoes.—Larger offerings, particularly of Transvaal tomatoes, came on the markets. The quality in general was good and the demand consistent, with the result that prices did not decline much. On the Johannesburg market National Mark tomatoes averaged 4s. 7d. per tray for the month, and ordinary tomatoes 2s. 4d. per tray.

Vegetables.—Most kinds were better supplied than during the previous month, particularly green peas, green beans, cabbage and

* All prices mentioned are averages.

leafy vegetables. Pumpkins were also still fairly plentiful. Prices in general were somewhat lower than for the previous month.

Fruit.—Largely quantities of oranges, mostly navels, were still offered daily. Naartjies were somewhat less plentiful and prices consequently higher. The markets were reasonably well supplied with cold storage apples, and prices on the whole were somewhat lower. Papaws were better supplied, but prices remained more or less on the same level as that of the previous month. Avocados were scarcer.

Eggs and Poultry.—The plentiful season for eggs commenced during the month, and large quantities were offered. Prices as a result declined fairly sharply, especially towards the end of the month. New-laid eggs averaged 1s. 9d. per dozen on the Johannesburg market, and 2s. 1d. per dozen on the Durban market. Poultry, especially fowls, were well supplied and experienced a strong demand at higher prices.

Index of Prices of Field Crops and Animal Products.

This index, as shown elsewhere in this issue, declined from 166 in June to 163 in July 1944 (with the period 1936-37–1938-39 as basis). The group " poultry and poultry products " declined fairly sharply from 257 to 187 in July as a result of the drop in prices of eggs.

" Hay " declined from 170 to 147 in July. " Dairy products " rose from 169 to 195 in July as a result of the increased subsidies on butterfat and cheese milk and the increased price of milk for condensing purposes as from 1 July 1944.

The other groups showed little or no change.

Index of Prices Paid for Certain Farming Requisites.

A table indicating the quarterly index of prices of a few important farming requisites, appears elsewhere in this issue.

According to this table, agricultural implements advanced from 158 in April to 160 in July (with the period 1936-38 as basis). Bags rose from 301 to 314 during the three months April to July; feeds from 151 to 159; fencing material from 236 to 248 and dipping and spraying materials from 132 to 135. Fertilizers, fuel and building materials remained more or less unchanged.

Potato Prices.

The maximum price of potatoes as fixed on 5 May 1944, viz. 5 lb. for 1s. for any quantity of potatoes sold by any person, has now been withdrawn again.

In the place thereof the following maximum prices have been fixed as from 11 August 1944:—

(1) Producer's prices, i.e. when the producer sells direct to the dealer, 33s. 6d. per bag (150 lb.) free-on-rail producer's station or on producer's farm according to buyer's option.

(2) Market price, i.e. sold by auction or otherwise on behalf of producer by an auctioneer, market agent, broker or agent; 36s. per bag (150 lb.)

(3) Wholesale price, i.e. when sold by a licensed dealer to another licensed dealer, 37s. 6d. per bag (150 lb.)

(4) Retail price:—

(i) 38s. per bag (150 lb.) for quantities of 150 lb. or more;

(ii) 3¼d. per lb. for quantities less than 150 lb.

The above maximum producer's price will remain in force up to and including 21 October 1944, unless otherwise directed; the market and wholesale maximum price up to and including 25 October 1944; and the retail price up to and including 28 October 1944, unless otherwise directed.

Seed-potatoes.—The maximum prices of seed-potatoes have been fixed as follows from 11 August 1944:—

(*a*) With a Government A certificate, 45s. per bag (150 lb.);

(*b*) With a Government B certificate, 42s. 6d. per bag (150 lb.).

The previous fixed prices for Government Certificate A and B seed-potatoes, as fixed on 16 June 1944, were 42s. 6d. and 35s. per bag (150 lb.), respectively.

For full particulars regarding all the above fixed prices of seed-potatoes and other potatoes see *Government Gazette Extraordinary* of 11 August 1944.

Agricultural Conditions in the Union during July 1944.

Rainfall and Climatic Conditions.—In the Western Cape Province and south-eastern coastal areas of the Cape Province the rainfall varied from satisfactory to good. In the rest of the country, however, climatic conditions were exceptionally dry, cold and windy, while frost was fairly common. Prospects for an early spring are, however, good.

The condition of stock consequently deteriorated further. Lamb crops, particularly in the Karroo and the drier western parts of the country, were also relatively poor. Few stock diseases occurred.

Winter cereals in the western Cape Province, as well as on the Transvaal highveld, made satisfactory progress. In the Orange Free State, however, lice caused considerable damage to young crops. In the drier areas like the north-western Cape Province winter cereals were sown on a much smaller scale than usual owing to the poor precipitation.

Potatoes and other vegetables were still scarce, except in parts of the Transvaal lowveld where fairly good crops are expected.

Farmers in the maize areas were still busy reaping maize, but lack of sufficient labour and transport caused considerable difficulty in parts. A certain amount of assistance was, however, rendered by military lorries and prisoners of war which have been made available. Farmers in the Transvaal middleveld were still busy planting tobacco.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39	92	107	96	89	79	102	106	92	9[illegible]
1939-40	86	107	77	95	115	105	106	89	103
1940-41	109	113	106	156	102	108	110	104	108
1941-42	121	134	143	203	102	131	134	145	123
1942-43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158
February	168	183	134	188	122	144	176	235	158
March	167	183	124	179	122	144	174	240	157
April	167	183	132	262	122	144	170	279	162
May	183	183	158	289	122	169	166	273	167
June	182	183	170	315	122	169	161	257	166
July	182	183	147	317	122	195	163	187	163

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet-potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

SEASON (1st July to 30th June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade I.		Natal.	O.F.S.	Transvaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939-40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940-41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941-42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942-43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 4	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	16 6	14 10	11 6
April	23 1	21 11	30 2	30 4	29 9	25 11	25 4	30 2	24 0
May	27 10	26 7	30 7	29 6	29 4	28 10	29 2	28 10	26 3
June	29 8	27 6	—	—	30 0	29 10	29 7	29 8	28 4
July	30 0	—	—	—	29 6	29 7	28 3	30 0	30 0

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (a)	Fertilizers. (b)	Fuel. (c)	Bags. (d)	Feeds. (e)	Fencing Material. (f)	Dipping and Spraying Material. (g)	Building Material. (h)
Base—								
1936-38........	100	100	100	100	100	100	100	100
1939...........	105	106	98	146	90	114	100	103
1940...........	120	139	117	171	95	176	112	124
1941...........	124	170	124	175	109	208	115	144
1942—								
January........	121	146	125	188	115	229	117	164
April..........	122	146	134	194	127	228	117	165
July...........	124	146	146	220	147	231	116	167
October.........	124	146	152	224	144	230	116	171
1943—								
January........	126	145	154	232	143	238	120	174
April..........	126	145	154	234	150	238	122	176
July...........	126	145	156	235	157	239	132	179
October.........	142	168	156	249	155	240	132	181
1944—								
January........	154	161	156	304	149	240	132	182
April..........	158	161	156	301	151	236	132	184
July (j)........	160	161	156	314	159	248	135	183

The following is the composition of the above groups. (The items are weighted according to their respective importance):—

(a) Ploughs, planters, seed drills, harrows, cultivators, ridgers, mowers, binders, hay rakes. silage cutters hammer mills, separators, windmills. shares, land sides, mouldboards, knife, pitman, guard.
(b) Superphosphate, ammonium sulphate, potash-muriate, bonemeal.
(c) Petrol, power paraffin, crude oil, grease, lubricating oil.
(d) Woolpacks, grain bags, sail twine, binder twine.
(e) Mealies, bran, oats, lucerne, groundnut-oil cake, bonemeal, salt.
(f) Fencing wire, standards, baling wire.
(g) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
(h) Corrugated iron, deals, cement, lime, flooring boards.
(j) Preliminary.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1st July to 30th June).	ONIONS (120 lb.).						SWEET POTATOES. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Transvaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannesburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939-40.........	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41.........	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941-42.........	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942-43.........	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January.......	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February......	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March.........	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April.........	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June..........	17 3	17 4	15 3	18 1	12 0	18 9	8 5	8 6	9 2
July..........	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August........	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September.....	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October.......	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
November.....	16 5	—	19 7	—	22 9	25 1	13 5	11 11	10 8
December......	12 11	13 10	9 3	15 1	18 6	16 6	12 0	10 5	9 9
1944—									
January.......	11 3	10 9	8 8	12 3	9 6	11 7	14 1	9 4	11 10
February......	12 7	14 0	7 10	11 7	12 9	13 9	15 8	10 10	11 6
March.........	14 4	14 10	11 1	15 0	13 5	15 1	12 11	8 6	10 10
April.........	16 6	16 11	13 7	17 0	14 0	18 2	12 6	8 8	9 8
May...........	17 2	19 10	15 6	19 7	20 3	21 7	12 3	13 5	9 6
June..........	26 1	21 11	18 8	23 2	22 2	22 11	16 3	14 9	11 1
July..........	14 9	21 6	18 6	21 2	24 5	23 11	16 10	12 4	11 2

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.). Johannesburg (a). Cape.	Johannesburg (a). Transvaal.	Cape Town 1st grade.	Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.). F.o.r. Producers' Stations. K1.	K2.	Dry Beans (200 lb.). bags. Johannesburg (a). Speckled Sugar.	Cow-peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2
February	5 2	3 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March	4 11	3 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6
April	5 3	4 6	7 2	3 9	17 9	17 7	71 6	38 9	44 0
May	6 4	3 9	7 3	4 4	18 0	18 6	71 8	37 11	54 5
June	6 9	5 6	—	4 11	16 10	16 10	96 1	42 0	78 10
July	5 9	4 11	7 5	4 7	16 2	16 2	92 3	42 0	64 8

(a) Municipal Market.
(b) Seasonal year for Kaffircorn 1st June-31st May; Dry Beans 1st April-31st March; Lucerne and Teff 1st July-30th June.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1st July to 30th June).	Green Beans (Pocket 20 lb.). Johannesburg.	Cape Town.	Durban.	Green Peas (Pockets 20 lb.). Johannesburg.	Cape Town.	Durban.	Carrots (Bag). (a). Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942-43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	18 2
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	19 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 11	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11
December	2 1	0 6	2 5	3 8	1 5	5 10	8 6	7 0	7 7
1944—									
January	1 9	1 2	3 5	4 7	1 6	6 7	7 4	3 5	7 10
February	4 4	2 1	4 0	7 2	—	5 9	9 0	6 0	15 1
March	2 8	3 8	2 0	6 9	5 0	6 6	13 6	8 11	24 5
April	1 10	1 11	1 4	3 7	2 3	4 6	10 3	12 5	35 1
May	3 5	2 10	2 9	7 4	5 3	4 10	9 10	12 7	27 0
June	6 6	9 1	5 4	7 9	6 4	6 5	11 10	13 6	20 6
July	4 9	8 4	5 3	4 1	4 7	5 7	9 11	13 11	19 0

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb. Cape Town, 90 lb.: and Durban, 120 lb.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1st July to 30th June).	CABAGES (Bag). (a)			CAULIFLOWER. (Bag). (a)			TOMATOES (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41.........	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941–42.........	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942–43.........	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January.......	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February......	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March.........	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April..........	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May...........	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June..........	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August........	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September.....	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October.......	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November.....	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December.....	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January.......	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2
February......	7 5	7 8	22 2	6 8	—	—	4 7	1 9	2 9	2 3
March.........	13 4	10 6	25 7	10 4	8 11	15 6	6 8	3 3	2 5	2 5
April..........	11 3	10 11	22 8	9 1	8 5	12 2	5 11	2 10	3 1	2 4
May...........	11 11	7 10	18 0	10 5	8 2	13 10	5 6	2 10	3 8	2 5
June..........	12 2	8 9	12 0	11 10	10 2	11 11	4 10	2 6	4 0	1 8
July..........	9 10	8 10	8 5	7 8	7 2	7 2	4 7	2 4	2 10	1 0

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb. Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

SEASON (1st July to 30th June).	EGGS.			FOWLS (Live, each).			TURKEYS (Live, each).		
	Johannesburg, New-laid. Per Dozen.	Durban, New-laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939–40.........	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940–41.........	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941–42.........	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942–43.........	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January.......	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February......	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March.........	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April..........	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May...........	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June..........	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July..........	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August........	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September.....	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October.......	1 5	1 8	11 7	7 1	5 10	7 8	18 7	25 0	17 0
November.....	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December......	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 3
1944—									
January.......	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11
February......	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March.........	2 10	2 9	19 10	4 1	4 11	4 7	13 5	18 3	13 4
April..........	3 2	3 5	24 5	4 2	5 3	4 1	15 0	17 0	13 8
May...........	3 2	3 6	24 9	5 0	5 5	4 2	13 8	15 8	13 11
June..........	3 0	3 3	20 7	5 7	5 7	5 1	14 10	16 9	13 9
July..........	1 9	2 1	16 8	5 11	5 9	6 4	16 2	15 11	16 4

Prices of Avocados and Papaws on Municipal Markets.

SEASON.	AVOCADOS (Per Tray). (a) Cape Town.	Durban.	Johannesburg. Ordinary.	Johannesburg. N.M.	PAPAWS. (b) Cape Town Std. Box.	Durban. Tray.	Johannesburg. Ordinary Std. Box.	Johannesburg. N.M. Std. Box.	Port Elizabeth Std. Box.	Bloemfontein Std. Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	1 6	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	1 8
1939-40.........	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940-41.........	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9
1941-42.........	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942-43.........	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0
1943—										
January.......	4 3	—	3 9	6 4	2 8	1 8	2 0	3 9	3 1	1 8
February......	2 3	—	2 8	5 8	2 6	1 9	3 6	4 11	6 4	2 6
March.........	2 1	1 1	2 7	3 7	2 11	1 9	3 9	5 2	4 10	2 11
April..........	2 3	0 10	2 6	3 9	4 2	1 10	3 3	4 4	6 0	3 6
May...........	2 5*	1 5	2 5	3 9	3 11	1 6	2 11	4 1	3 3	2 9
June..........	2 9	1 5	2 9	4 8	3 0	1 9	2 9	3 9	3 11	2 5
July...........	3 6	2 4	3 3	4 2	2 11	1 8	2 4	3 2	3 0	2 9
August.........	4 8	3 2	4 6	5 5	2 9	1 6	2 1	3 4	2 10	2 4
September.....	5 0	3 7	5 9	6 7	3 1	1 9	2 4	3 3	3 5	3 0
October........	5 2	2 9	5 6	5 11	3 9	1 3	2 5	3 0	3 1	3 0
November.....	7 1	3 10	4 11	4 3	3 5	1 2	1 11	2 8	3 8	2 2
December......	4 8	4 6	4 5	4 9	2 11	1 2	2 3	3 3	3 6	2 7
1944—										
January.......	5 0	3 0	4 8	6 8	3 4	1 1	2 1	3 1	2 8	2 7
February......	2 5	1 7	3 1	4 0	1 10	2 4	4 11	5 1	—	2 10
March.........	2 5	1 8	2 9	4 6	5 4	1 9	6 3	7 3	—	3 10
April..........	2 7	1 0	2 9	4 3	4 9	1 4	4 7	5 2	4 9	4 3
May...........	3 6	1 7	3 8	5 1	3 7	1 9	3 5	4 4	4 4	3 5
June..........	6 5	1 10	5 8	6 11	3 11	1 1	2 10	3 8	3 0	2 3
July...........	4 10	—	6 4	6 1	2 6	1 6	3 3	4 4	2 7	2 11

(a) Season 1st January to 31st December.
(b) Season 1st April to 31st March.

Prices of Bananas and Pineapples on Municipal Markets.

SEASON.	BANANAS (Per Crate) (a) Cape Town.	Johannesburg.	Pretoria.	PINEAPPLES. (b) Cape Town. Box.	Durban. Doz.	Johannesburg. Ordinary. Doz.	Johannesburg. Queens and Giants. Doz.	Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.........	22 5	9 10	16 5	5 4	3 3	1 1	—	3 5	1 2	4 10
1939-40.........	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940-41.........	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941-42.........	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942-43.........	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943—										
January.......	25 5	8 4	11 1	6 2	1 7	1 5	2 1	5 3	1 4	5 5
February......	27 2	9 5	18 10	4 4	2 2	1 0	1 1	3 9	1 1	4 7
March.........	26 11	9 10	13 2	4 5	3 4	0 11	1 0	3 2	2 1	4 11
April..........	29 11	10 0	21 4	6 7	2 9	1 9	2 0	4 3	3 4	6 4
May...........	27 0	9 0	22 9	7 0	2 0	2 4	2 10	6 6	3 0	7 5
June..........	28 1	11 6	12 4	6 3	1 9	2 0	2 0	5 7	1 8	6 2
July...........	26 6	13 3	22 7	7 8	3 2	2 9	3 4	5 7	1 11	6 0
August.........	26 4	12 2	24 7	9 5	5 4	2 10	4 7	6 1	2 10	8 3
September.....	28 9	12 7	25 9	13 3	8 4	7 1	9 0	9 8	4 6	13 9
October........	34 9	18 11	34 10	10 1	8 7	4 5	6 0	9 2	4 8	11 2
November.....	46 11	17 11	33 0	6 7	9 7	2 7	3 11	9 3	5 11	9 10
December......	27 1	9 3	19 4	9 9	3 11	2 5	5 1	9 1	6 5	10 5
1944—										
January.......	32 4	12 0	—	8 3	1 8	1 7	3 4	8 8	2 3	6 1
February......	28 6	9 0	20 6	4 9	1 8	1 0	1 0	4 4	2 3	4 5
March.........	38 8	16 1	17 3	7 8	2 9	1 6	1 4	3 9	3 0	5 5
April..........	46 11	16 7	22 10	6 9	4 3	2 4	—	5 1	1 11	7 0
May...........	35 1	11 2	21 0	7 9	5 11	2 10	1 11	7 1	2 1	7 7
June..........	34 5	9 9	13 9	10 0	3 1	3 6	3 1	6 8	2 9	11 6
July...........	28 1	12 5	18 1	9 0	3 3	3 10	3 6	10 1	2 6	10 1

(a) Season 1st January to 31st December.
(b) Season 1st October to 30th September.

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[*Photo on Cover by S.A.R. & H.*]

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Koch Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:—

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.
(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.
(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.
(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.
Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture and Forestry, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture and Forestry, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is published fortnightly by all newspapers and other journals throughout the country.

Farmers' Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also maintains a daily broadcasting service to farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the publications of the Department, including the Radio Service, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

Vol. 19 OCTOBER 1944 No. 223

Editorial:

Wheat Production in Maize Areas.

FEW farm products have shown such a sudden and significant swing in the pendulum from surpluses to shortages as has maize. The consumption of maize has increased considerably during the war, primarily as a result of the greater demand. In many of the principal maize-growing areas the past season was admittedly exceptionally unfavourable, production being handicapped at the same time by shortage of labour, fertilizer and implements, but, in addition, some producers have evinced a tendency to restrict systematically the production of this staple crop. Unfortunately the reasons for this tendency are in many cases based on unsound grounds, one of these being the ousting of maize by winter cereals under the incentive of promising winter rains during the past few seasons. Anyone who knows the precarious nature of our climate should have realized that such conditions were abnormal. Despite this, however, many producers not only began to concentrate upon the production of winter cereals on an unprecedented scale, but actually made capital investments and changes in their organization as if they intended to produce mainly winter cereals in future. Where the latter had previously played only a secondary rôle farmers apparently began to be obsessed with the idea that they should take the place of maize. Farmers who should have thoroughly realized the speculative nature of such a reversal of policy, nevertheless reasoned that the possibilities of the mechanized handling and relatively high prices would counterbalance the greater hazards attached to the cultivation of winter cereals.

Against this must be set the inescapable fact that the prospects of the present winter-cereal crop in the summer rainfall area appear to be extremely poor. Tremendous damage has been caused either by lice or by unfavourable climatic conditions. If the onset of the summer rains is delayed much longer the crop will be only a very small percentage of that of last year.

Under dry-land conditions maize must on no account be planted in rotation with wheat, so that those farmers who have already planted the greater part of their lands to wheat will now have to decide whether they are going to plant maize or not during the forthcoming summer season.

The danger exists that, if planting is delayed too long with a view to giving future rains a chance to exercise a restorative effect on the soil, it will not be possible to prepare wheat lands in time for a maize crop. Wheat lands from which a remunerative crop can no longer be obtained, should rather be grazed down now, and, if moisture conditions permit, planted to maize. Lands which can be ploughed only late in the summer season, will be less suitable for maize production and the ploughing in of undecomposed plant material may in some cases cause a temporary shortage of plant food in the soil, with the result that young maize plants will have a yellow appearance, and be retarded in their growth.

In any case, grazing is scarce at present, so that wheat which either shows a poor stand or has been damaged by lice will in all probability be much more valuable as pasturage than for the production of a grain crop. Therefore, utilize your poor wheat lands immediately by grazing them down, and then thorougly prepare the soil for the production of maize.

(F. X. Laubscher, Field Husbandry Officer, Potchefstroom.)

Use of Phosphate.

Phosphate is undoubtedly the most important plant nutrient of which there is a shortage in the soil in the Union, and it can not be replaced by other plant foods or lime. Seeing however, that there is a great shortage of super-phosphate at present, farmers are strongly advised to use the phosphate allotted to them as judiciously as possible. Apply the phosphate only to soil which can profit most by such an application. A good policy is to apply the phosphate to the soil a considerable time before planting, and then to work it in well, e.g. when the soil is ploughed in winter.

(Dr. N. J. Viljoen, Agricultural College, Potchefstroom.)

Allotment of Government Guano.

ONLY one allotment of guano will be made for the year 1945, commencing in April but earlier if circumstances permit.

The guano which will be available for disposal in this allotment is limited for distribution to *bona fide* farmers and gardeners within the Union who are to produce only wheat, vegetables, onions and potatoes. For no other type of crop will guano be available.

Applications for an allotment of guano must be submitted on the revised prescribed form, U.A.D. 228, to the Superintendent, Government Guano Islands, Van Riebeek Chambers, 32 Riebeek Street (P.O. Box 251), Cape Town, before noon on 31 October 1944, after which date no application will be accepted in respect of this allotment. (Telegraphic applications will in no circumstances be accepted.)

Completed application forms must be signed by the person requiring, and entitled to, the guano before a Justice of the Peace or Commissioner of Oaths. Incomplete forms will be returned for completion.

Applicants for guano are notified that in submitting applications, the purpose for which guano is required and the area (in morgen) under cultivation must be stated on the application form. Applications must be submitted by registered owners or lessees actually carrying on farming operations; only one application will be accepted in respect of any one farm, or group of contiguous farms of the same owner or lessee.

Guano allotted will have to be taken up and paid for not later than 29 September 1945, after which date it will not be available.

The price of guano is £10 per ton of 2,000 lb. or 20s. per bag of 200 lb. net weight when packed, delivered in bags, free on rail, or on board ship, Table Bay Docks. The minimum quantity supplied, is 200 lb. A subsidy of £1 per ton is allowed by the State so that the actual price to the applicant is £9 per ton or 18s. per bag. Railage or freight is payable by the applicant to whom the guano is consigned,

[*Continued on page* 622.

Lucerne for Fattening Sheep.*

H. P. D. van Wyk, W. A. Verbeek and S. A. Oosthuizen, Vaalhartz Experiment Station, Division of Animal and Crop Production.

AT the Vaalhartz Settlement animal husbandry plays a subordinate rôle, and as long as the present high war prices for agricultural products prevail, the position will probably not change. As soon as the war is over, however, and the prices for agricultural products probably are again on the pre-war level, a more stable enterprise will have to be resorted to, so that animal husbandry may occupy a more important place. More attention will then have to be paid to one or more of the following activities, namely, milk production, pig farming, breeding of slaughter stock, etc.

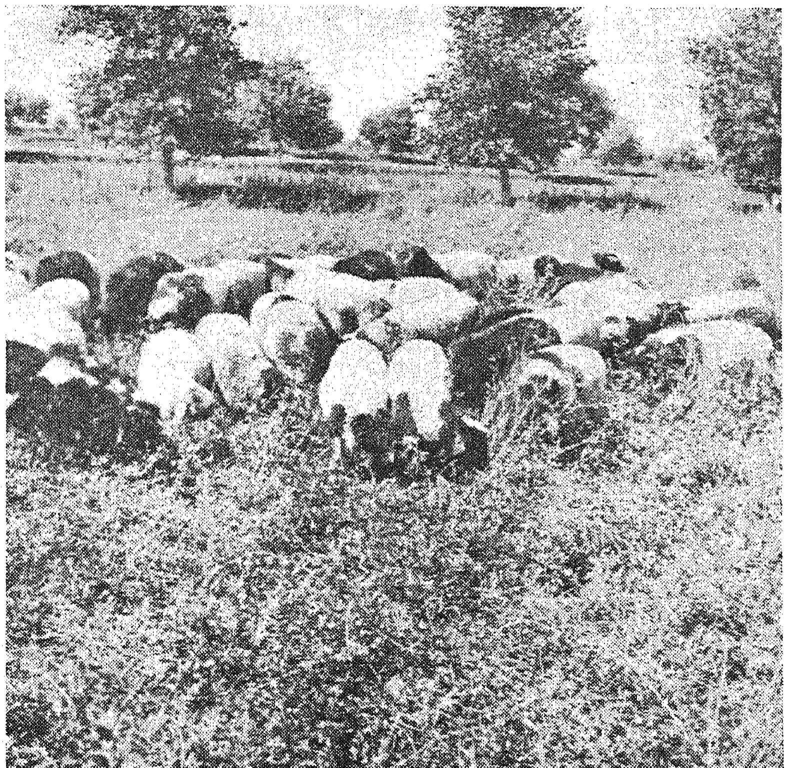


FIG. 1.—Groups A and B on lucerne pasture.

If grain farmers would concentrate more on stock, they would contribute much towards solving the question of soil fertility and be in a position to make good use of any type of hay which might be available. Moreover, if they regularly keep a few old, lean, or cheap sheep for fattening, they would be in a position to supply their own meat to a large extent.

With a view to assisting settlers in the breeding of livestock the Division of Animal and Crop Production is conducting experiments at the Vaalhartz Experiment Station to determine the most economic methods for utilizing available feeds and also the degree in which

* Also refer to the article "Lucerne for Fattening Sheep" in *Farming in South Africa*, August, 1942.

these feeds—or the same feed in its various forms—supplement one another. During the summer of 1941-42, e.g., experiments were carried out on the fattening of full-grown, lean sheep on lucerne pasture as sole feed. The results have shown that such sheep show a good increase in weight (namely 0·24 lb. per sheep per day) and after a period of 2 months of grazing the fat cover of the sheep carcase was excellent. The experiment has shown further that it is possible to obtain a successful finish on lucerne pasture alone.

Nature of New Experiment.

In the present experiment an endeavour is made to determine how far (1) lucerne pasture. (2) lucerne hay plus lucerne pasture, and (3) lucerne hay without any supplementary feed as fattening ration for young sheep can be compared and whether such an enterprise will prove remunerative.

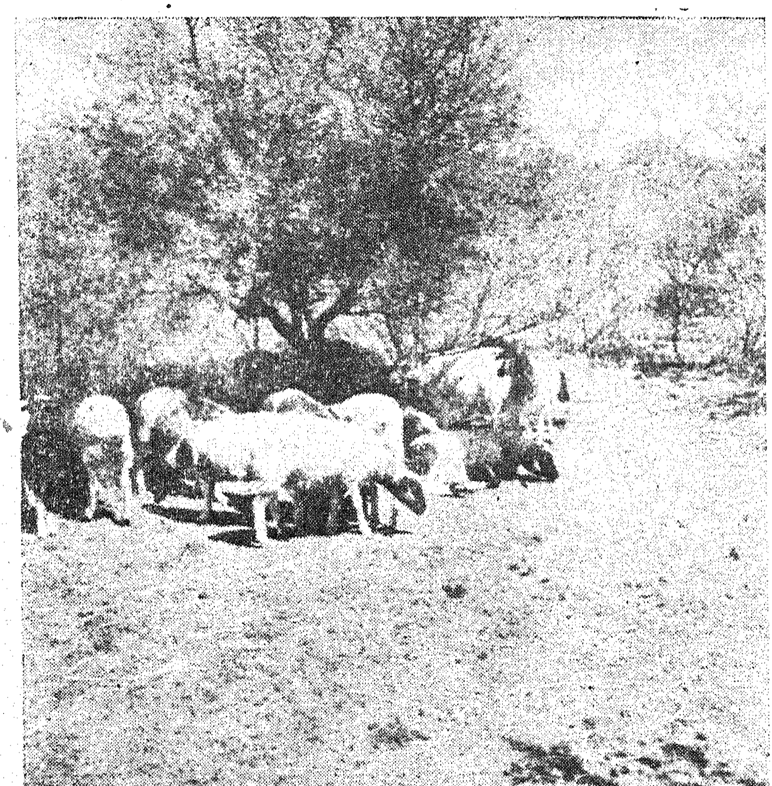


FIG. 2.—Group C in the feed camp.

During the 1943 season a number of ⅜ Dorset × Persian lambs which had suffered a setback and consequently had not even reached an average live weight of 45 lb. at the age of 7 months, were grazed on the Vaalhartz Experiment Station. These lambs were born in April-May and were run on pasture (lucerne pasture and later winter cereal). They were weaned on 15 July and brought on veld at the beginning of October. On 15 November 1943, when the present experiment was commenced, they were still kept on this veld. Since these lambs were already too old for marketing as fat lamb, but had not reached the two-tooth age, it was decided to fatten them before they shed their teeth, since meat derived from such young

sheep is graded on the local market as lamb and fetches higher prices than meat obtained from older sheep. The experiment was commenced with 54 lambs, consisting of equal numbers of ewes and hamels, which were divided according to weight and sex into 3 comparable groups which received the following treatments:—

Group A.—Lucerne pasture during the day and kept in kraal at night.

Group B.—Lucerne pasture during the day and lucerne hay fed at night.

Group C.—Fed lucerne hay only.

The hay consumption of Groups B and C was determined but otherwise all lambs were treated in the same manner and regularly weighed after a starvation of 12 hours. The lambs had free access to water and a salt bone-meal lick—and were also dosed each month with nodular worm remedy or a mixture of tobacco and copper sulphate. Groups A an B grazed together during the day, a system of rotational grazing being followed which allowed of the lambs remaining on the same pasture for more or less a week. The same pasture was never grazed consecutively, the aim being to rest the lucerne and also to control worm infestation. The lucerne was invariably grazed at the same stage of growth, namely at the advanced bud or early flowering stage. Hoven presented no difficulty.

After the lambs had been grouped, two young hamels weighing more or less the average of the group concerned, were slaughtered. The slaughter percentages were determined and the carcases measured and graded. When the experiment was discontinued on 18 January 1944 the slaughtering was repeated.

Findings and Discussion of Results.

The weight increases of the 3 groups are indicated in Table I.

TABLE I.—*Average initial and final weights of the three groups of lambs as also the daily weight increases for 64 days.*

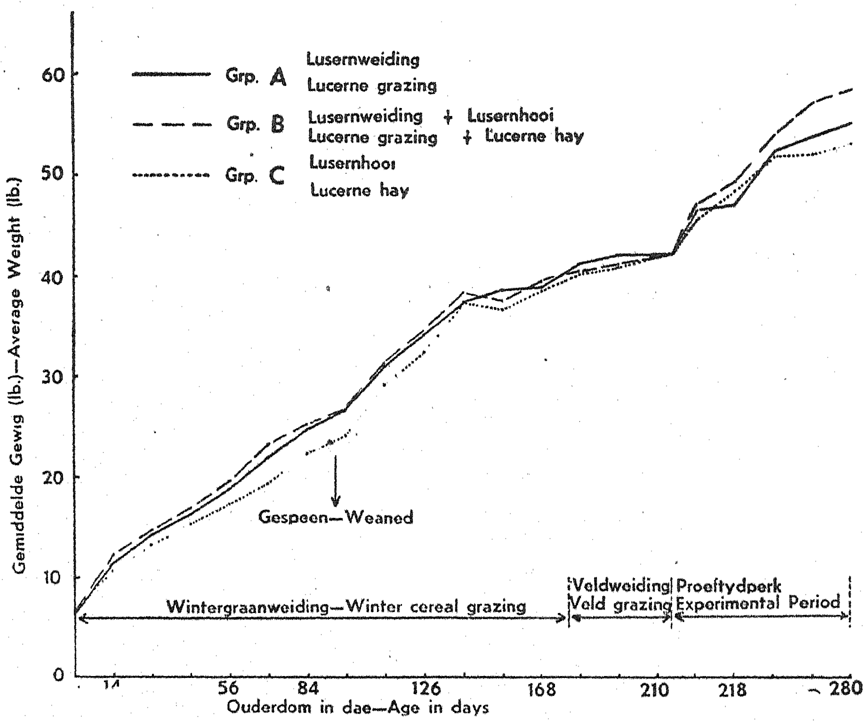
Group.	Number.	Treatments.	Average initial weight in lb.	Average final weight in lb.	Average total increase in lb.	Average daily increase in lb.
A	16	Lucerne pasture	42·1	55·6	13·5	0·21
B	16	Lucerne pasture + hay........	42·0	59·0	17·0	0·27
C	16	Lucerne hay.....	42·2	53·7	11·5	0·18

The difference in weight increases were statistically determined according to the method of analysis of variants and it was found that treatment B (lucerne pasture plus hay) yielded reliably better weight increases than either treatment A or C.

In the accompanying graph, which indicates the fortnightly weight increases of the 2 groups from birth to the discontinuation of the experiment, the uniformity of the three groups can be clearly seen and also the fact that Group B yielded better and more regular increases than either groups A or C. Moreover, there is a striking similarity between the rate of growth during the experiment period and the first 84 days immediately following birth. During September, when the winter cereals were rapidly getting poor, and

also in October to mid November, when the present experiment was commenced and veld grazing was poor, no weight increases worth mentioning were obtained. A striking increase in weight immediately

Groeikurwe van Lammers—Growth Curve of Lambs



after the experiment was commenced as compared with the preceding 2 months is noticeable.

TABLE II.—*Slaughter data (average of 2 lambs).*

Group.	Live weight. (lb.).	Weight of cold carcase. (lb.).	Eye-muscle measurements. (cms.).			Grading			Fat cover (max. 10).
			Length.	Width.	Fat.	S.	P.	I.	
A									
Commencement	41·5	18·1	4·1	2·4	0·05	–	1	1	7 and 5
End...........	55·5	24·7	4·7	2·7	0·10	–	1	1	8 and 8
B									
Commencement	40·5	16·2	3·5	2·1	0·00	–	–	2	6 and 4
End...........	58·5	25·2	4·6	2·5	0·15	1	1	–	8 and 8
C									
Commencement	40·5	16·4	3·8	2·0	0·00	–	–	2	7 and 5
End...........	56·5	21·7	4·8	2·5	0·10	–	2	–	8 and 8

The carcases of the lambs slaughtered at the commencement and end of the experiment were graded according to the standards prescribed by the Department of Agriculture and Forestry. Although it is impossible to draw comparisons between the 3 groups, the assumption would be justified that, with a few exceptions, all lambs could be graded higher at the end of the experiment than at the beginning,

i.e., there was an increase in carcase weight coupled with an improvement in the quality of the meat. Grade is an important factor since the price of meat is fixed on a grade basis.

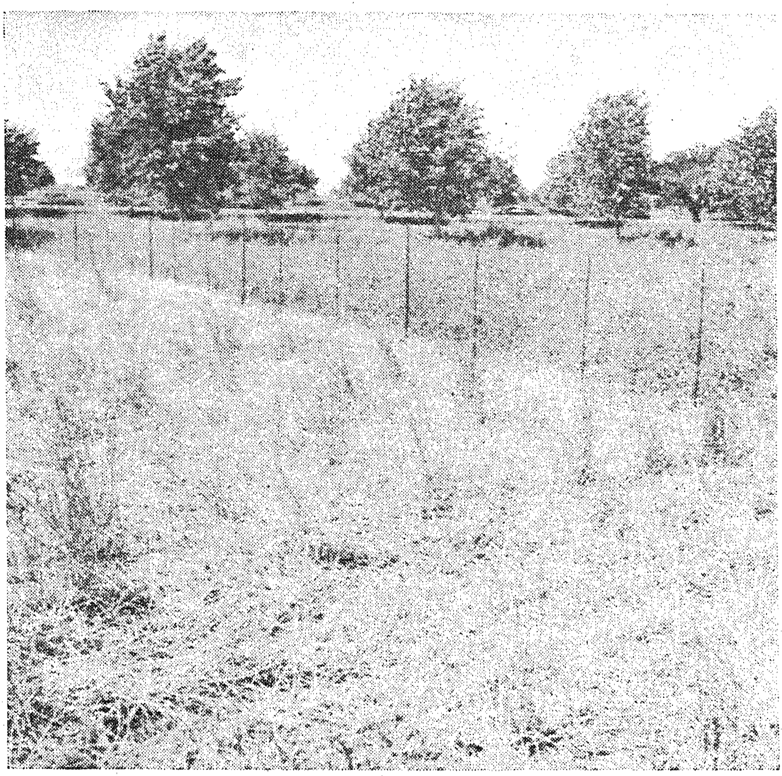


FIG. 3.—Stubble left after grazing.

Feed Consumption and Production Costs.

The hay consumption of Groups B and C has been determined. Groups A and C, which grazed together during day time, grazed a total area of 1·36 morgen of lucerne. Group C received a total of 3,740 lb. of hay.

If it is assumed that all three groups had access to the same quantity of hay calculated in terms of hay and the quantity was the same as that fed to Group C, namely 3,740 lb., such assumption would afford a good basis of comparison. Calculated on this basis, 0·73 morgen of pasture yields 3,740 lb., or 1·0 morgen 2·5 tons of hay, which happens to be a good average yield for the sheep camps concerned.

TABLE III.—*Quantity of lucerne fed and quantity which remained, in terms of hay.*

Group.	Fed.	Left.	% of pasture.
	lb.		
A	3,740 (0·73 morgen pasture)................	Stubble	Stubble.
B	3,740 (0·63 morgen pasture + 700 lb. hay).	Stubble + 320 lb. stalks	46% of hay.
C	3,740 (hay only)........................	1,368 lb. stalks.	37%.

Although group B (16 lambs) received hay at night, it was seldom necessary to give a ration of more than 10 lb. hay per night. Group C received from 40-80 lb. per day. The percentage stubble left after grazing could not be determined.

If it is assumed that all lambs at the beginning of the experiment were of grade I and at the end of the experiment of prime grade, that the price of grade I lamb is 9¼d. and that of prime 9¾d. per lb., a rough indication of the economic aspect of the fattening of lambs can be given to convey some idea of the price which the hay would have realized, had it been fed to lambs.

Table IV.—*Total increase of value of carcases per group of 16 lambs and the price which lucerne would have realized as a feed.*

up.	Total value of carcase.		Increase in value.	Price of Lucerne hay per 100 lb.
	Commencement @ 9¼d.	End @ 9¾d.		
	£ s. d.	£ s. d.	£ s. d.	d.
A	10 18 1	15 3 7	4 5 6	27·2
B	10 17 6	16 2 2	5 4 8	33·6
C	10 18 4	14 13 3	3 14 11	24·0

A large amount of wastage took place in the case of lambs which grazed as well as in that of those which received the hay, for the animals left a high percentage of the feed in the form of stalks or stubble. The lambs which received hay, selected leaves only and left the stubble whereas those which grazed showed preference for leaves and soft tops.

Recapitulation.

1. In the fattening experiment 54 of ⅝ Dorset × Persian lambs, 7 months old, were used on lucerne pasture; lucerne pasture plus lucerne hay and lucerne hay alone.

2. The experiment lasted for 64 days and the average daily increase in weight obtained for the 3 groups was 0·21 0·27 and 0·18 lb. respectively.

3. The group of lambs which received lucerne pasture plus lucern hay, showed reliably better weight increases than any of the other two groups.

4. At the commencement and close of the experiment two small hamels in each group were slaughtered and particulars of the carcases taken. A definite improvement in carcase measurements and quality was observed.

5. A large percentage of feed wastage occurred in all treatments. No hoven difficulties were experienced.

6. The economic aspect of the fattening of lambs according to the treatments mentioned, is briefly discussed.

Allotment of Government Guano:—

[*Continued from page* 616.

but railage must be prepaid when guano is consigned to a railway siding. In no case will guano be consigned or delivered to any person other than the applicant to whom an allotment has been made.

Payment will not be accepted for guano until allotment has been made.

Inquiries in connection with the allotment of guano must be addressed to the Superintendent Government Guano Islands, P.O. Box 251, Cape Town, from whom application forms are obtainable.

Searchlight on Wool from the North-Eastern Free State.

J. C. de Klerk, Sheep and Wool Officer, College of Agriculture, Glen.

DURING the past two seasons the writer was engaged in certain activities in connection with wool at the Port of Durban and had the opportunity of paying attention to certain aspects of the wool trade and making an analytical study of wool grown in the North-Eastern Free State. The main findings are given in this article.

Turn-over and Value of Free State Wool Received in Durban.

1939/40	60,069 bales.
1940/41	59,862 bales and 27,879 bags.
1941/42	62,161 bales and 34,159 bags.
1942/43	55,187 bales and 29,936 bags.
1943/44	44,313 bales and 23,122 bags.

The quantity of wool for the 1943-44 season is given up to 16 February 1944 only, since at that date the entire clip had not been disposed of, but it is highly improbable that the number of bales will exceed the 50,000 mark by much.

The average price realized on the Duran market for this year amounts to £16. 5s. 0d. per bale (European only) and to ± £1. 10s. per bag. The value of wool canculated up to 16 February amounts to £754,771 and for the season 1941-42 to ± £1,056,000. This proves that the cash value of wool from the area under review is by no means inconsiderable and that it constitutes an important percentage of the farm income. (About one-third of the wool received at Durban comes from the O.F.S.).

Size of Clip.

Careful records were made of the size of clips of the present season, up to and including the sales of 22.2.44.

Bales.	*Clips.*	*Percentage.*
2–5	1,101	36·5
6–10	894	29·6
11–15	441	14
16–20	212	7
21–25	117	4
26–30	77	2·5
31–40	65	2·1
41–50	47	1·5
More than 50	60	2
Total	3,014 clips.	

In this connection it should be borne in mind that some clips were of the short wool type and that in a few cases the wool was only a 10/11 months' growth. The quantities concerned were, however, only small and would not have affected the grand total. It is important to point out at this stage that the clips consisting of 2 to 5 bales were in the majority and that 80 per cent. of the clips consisted of less than 16 bales. More particulars on this aspect will be given at a later stage.

Classification of Districts According to Quality of Wool Produced.

An analysis of all fleece wool was made for the season 1942-43. The percentages of spinner's wool, good combings and inferior combings were determined in respect of each district and the list

below contains the names of the districts in the order of the quality of wool they produced:—

District.	Spinner's wool.	Good combings.	Inferior combings.
	%	%	%
Memel	50	49	1
Fouriesburg	40	40	20
Harrismith	35	60	5
Vrede	35	60	5
Warden	30	60	10
Lindley	30	56	14
Frankfort	22	71	7
Tweeling	21	51	28
Villiers	19	70	11
Steynsrust	11	80	9
Senekal	8	79	13
Bethlehem	7	71	22
Heilbron	5	80	15
Kroonstad	3	74	23
Ficksburg	2	67	31
Marquard	1	63	36
Reitz	0	75	25
Petrus Steyn	0	65	35
Clocolan	0	52	48
Parys	0	48	52

A few clips were sent from Bothaville, Wesselsbron, Odendaalsrust, Hoopstad, Theunissen, Vertersburg, Vredefort, Thaba 'Nchu and Ladybrand, but the quantities were so small that these districts were not taken into account. It should be stated here that, as may be expected, the grain-areas in general do not produce as much wool of superior quality as the Drakensberg grazing area.

For the season under review the percentages in respect of the types concerned were as follows:—

Spinner's wool	20%
Good topmaking	66%
Inferior topmaking	13%

This means that there were 5 bales of good topmaking and one bale of inferior combings to every 1½ bale of spinner's wool. (These figures refer to merino fleeces only and do not include coarse and coloured or cross-bred wool.)

Analysis of Fleece Wool for Season 1943-44.

An analysis of all fleece wool for the 1943-44 season up to and inclusive of the sales of 16 February 1944 is given below:—

Type.	*Bale.*	*Precentage.*
Spinner's wool	4,301	17·8
Good topmaking	15,399	64
Inferior topmaking	4,414	18·2

The percentage of spinner's wool received is less than that of last season, but a considerable quantity of the better and light types of wool from the Drakensberg area was still unsold, and consequently it may be taken that spinner's wool will again amount to 20 per cent. and that the percentage of inferior wool will decrease a little.

Quality of the Wool.

As far as rainfall is concerned, the past two years were undoubtedly exceptional, and one would have been justified in expecting the area to have produced a much larger quantity of spinner's wool. This, however, was not the case. In fact, many farmers are probably

dissatisfied with the prices at which their wool was sold this season although it was disposed of as a spinner's type. Generally speaking, two important facts should be borne in mind.

Firstly, the excessive rains had an adverse effect on most wool. The wool lacked bulk and, although much of it appeared to be light and clean, the fibres were wild and straight and showed a general lack of compactness and staple formation. Another striking feature in some clips was the dry and weathered tips of the fibres which, on being combed, will yield a high percentage of noil. Although much of the wool was clean and free from sand or dust. it nevertheless contained excessive suint which naturally decreased the yield and consequently also the price per pound.

Secondly, the tenderness of the wool. It will be generally admitted that our veld was abnormally poor last winter. Many farmers had a plentiful supply of green feed but the lands were too wet for grazing. In addition, continuous cold and wet weather was experienced. The inferior veld, together with the biting cold and dampness resulted in a break in the wool and consequently the clip could not be classed as spinner's wool. These factors explain in the main why this season less spinner's wool was obtained and why in many cases the price per lb. was lower than that of the previous season.

Inferior Wool.

A matter which is again causing concern is the large quantity of inferior wool. A review of the underlying causes will certainly not be out of place and each producer can determine for himself on what score he has lost money. Wool is regarded as inferior and is sold as such when—

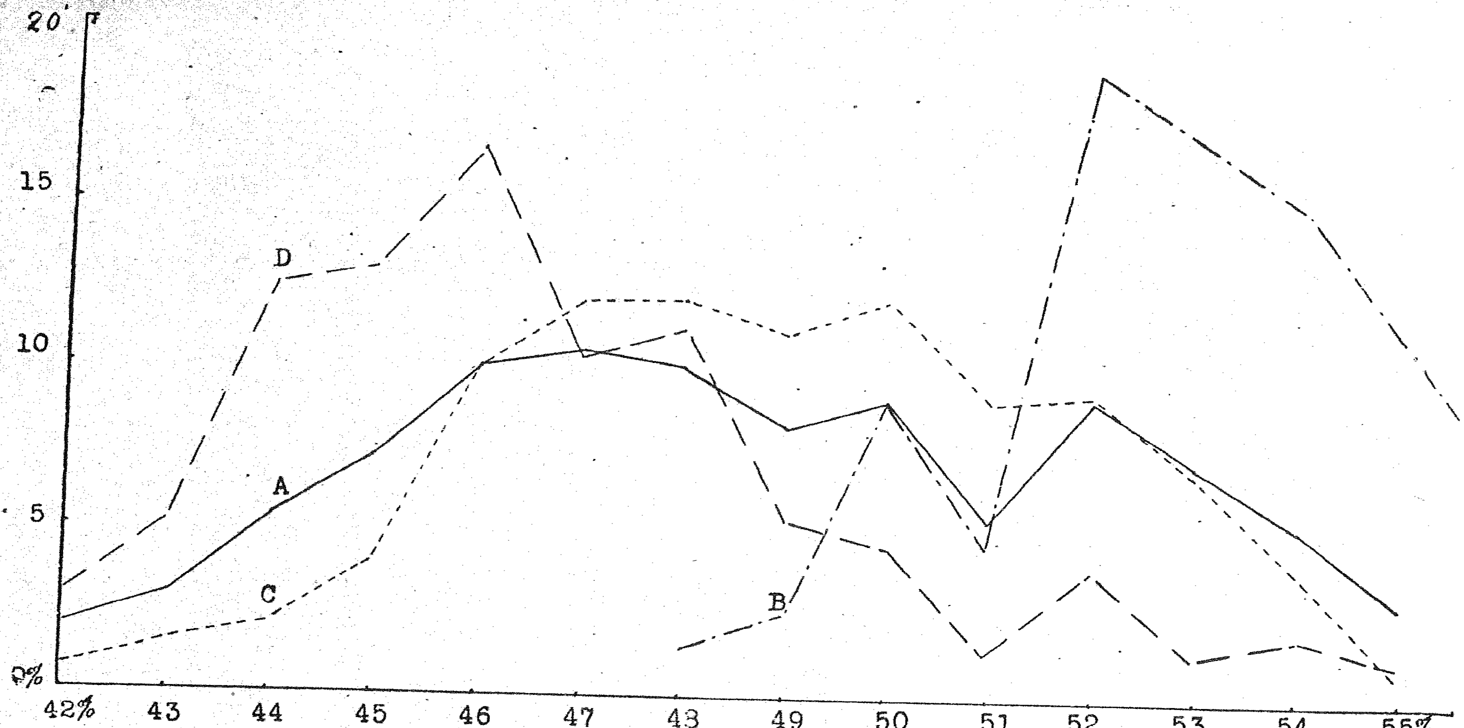
(1) the fleeces are unskirted and/or contains bellies;
(2) the fleeces contain kemp, Persian hair or coloured fibres;
(3) skin or dead wool is included with the fleeces;
(4) when it is very tender or has a sharp break;
(5) it consists of inferior dirty backs;
(6) it is infested with keds, khaki-bush seed and dust;
(7) it is ropy or watery;
(8) it lacks quality;
(9) it is dead or skin wool.

The writer is of the opinion that no sheep should bear an inferior fleece, and that wool farmers can grow much more spinner's wool by feeding, and managing their sheep better and by keeping the animals free from internal parasites, etc., and that the only wool which should fall into the good topmaking class, should be the backs of fleeces and/or the somewhat sandy or tender wool. The writer bases his optimism on the fact that clips of outstanding spinning quality and containing only the backs and a small quantity of sandy and/or tender wool, but no wool of an inferior type were received from the whole area and sold as good topmaking.

Relationship between Price, Type and Scoured Yield.

The writer will indicate that it is definitely remunerative to produce wool of the best quality only (and we are of the opinion that this is the only method which will enable us after the war to compete with the artificial fibre) and wishes in particular to point out the close relationship between price per lb., type of wool and scoured yield.

Graph A indicates the quantity of wool (on a percentage basis) which was valued on a scoured basis of 43 per cent, 44 per cent.



Graph indicating the clean yield of 6,098 bales of fleece wool (A), as well as the distribution of the clean yields for spinner's wool (B), good topmaking (C) and inferior topmaking (D).
(*N.B.*—The figures along the perpendicular line indicate the type percentage. Take, for example, the highest point of graph D. It is roughly opposite point 16·5 on the perpendicular line and point 46 on the horizontal line, i.e. only 16·5 of the D type of wool gave a clean yield of 46 per cent.)

etc., to as high as 55 per cent. The same wool was further analyzed; the percentage scoured yields at which inferior wool, good topmaking and spinner's wool were valued, is represented by D, C and B respectively. It is at once evident that wool must be light in condition before it can qualify for the spinner's class. Only a few lots qualified at 48 and 49 per cent., but in all other cases the scoured yield was 50 per cent. and more.

An equally striking fact is that heavy wool cannot be sold even as good topmaking—only a few lots qualified on a basis of 43 per cent. yield. Exceptionally heavy wool can only be run into an inferior topmaking class. We must, therefore, realize that we are only paid for scoured wool and (decidedly) not for impurities, and that a high percentage of impurity may even disqualify such wool from the spinner's type.

It is, therefore, clear that wool heavy in condition containing excessive oil and/or sand and dust, is usually classed as inferior. The few lots of 48 per cent. and higher (to 55 per cent.) qualified on the grounds that they consisted of very light backs or light fleece wool, which, because of some defect or other, such as the presence of kemp, tenderness, etc., could not be classed as good topmaking.

The relationship between spinner's wool, scoured yield and price per lb. is given below in comparison with scoured yield and price per lb. for both good topmaking and inferior topmaking types. (All degrees of fineness and lengths of two inches and longer are included.)

Type.	Scoured yield varies from	Average scoured yield.	Price per lb. unscoured varies from	Average price per lb.
	%	%		
Spinner's wool.....	48 to 60	52 to 55	16½d. to 23½d.	17d. to 19d.
Good topmaking...	43 to 56	46 to 52	12½d. to 18d.	14⅛d. to 16⅜d.
Inferior topmaking.	34 to 55	44 to 48	10½d. to 15⅝d.	11⅜d. to 14⅛d.

The scoured yield of wool thus constitutes an important factor since, as already shown, it may be the direct reason why a wool is not sold as a spinner's type; moreover, the higher the yield, the higher the price. For example, a good medium type of wool, 3 inches in length with a scoured yield of 47 per cent. will realize 15½d. per lb., but if the same wool had a scoured yield of 54 per cent. it would fetch 17⅞d. per lb.

Generally speaking, the Drakensberg area produces a much lighter type of wool than the grain area, but from the latter some very light clips were obtained as was proved in the case of wool with a scoured yield of 54 per cent. and higher, shorn in the districts of Steynsrust, Parys, Villiers, Cornelia, Heilbron, Frankfort, Tweeling, Edenville, Petrus Steyn Bethlehem, etc. Wool from Frankfort and Heilbron even produced a scoured yield as high as 56 per cent. and wool from Bethlehem as high as 58 per cent.

Analysis of Fineness of Wool Clips.

An analysis was made of the degrees of fineness of 12,672 bales of fleece wool according to the standards prescribed by the British Wool Commission and the following results were obtained:—

Fine wool—larger percentage 70's or more 4,098 bales or 32·3%
Medium wool, 64/70's ... ... 8,314 bales or 65·6%
Strong wool, 60/64's ... ... 260 bales or 2%

From these figures it would appear that the wool grown in this area is mainly of the medium type. From experience we know, however, that it is impossible to form a correct judgement on the strength of these figures alone, chiefly for the following two reasons:—

(i) In the inferior topmaking class there is no provision made for fine wool and all faulty wool—however fine it may be—is regarded as 64/70's.

(ii) If the spinnig counts are mixed, i.e. if medium wool is mixed with appreciable quantities of fine wool, such wool is regarded as medium.

It is therefore necessary to make use of reducing factors in order to place fineness grades in the right perspective. This is only possible if an analysis of the same wool in respect of spinner's, good topmaking and inferior topmaking is available. In this case the quantities are as follows:—

Spinner's wool	2,008 bales.
Good topmaking	8,304 bales.
Inferior topmaking	2,360 bales.

The reducing factors which are used in this connection were determined as accurately as possible and have the approval of responsible brokers; it should, however, be understood that it is impossible to give the correct factors, since the entire contents of all the bales cannot be inspected. Consequently the reducing factors are only an estimate based on experience and are used in an attempt to represent what the actual state of affairs would have been, if the spinning counts were not mixed.

First step.—We reduce the 2,360 bales inferior topmaking typed as 64/70's (in reality only 19 bales of this inferior wool were typed as 64's) by 45 per cent., i.e. by 1,062 bales, and add the latter to our fine wool. The position will then be as follows:—

Fine wool	4,098 + 1,062 bales =	5,160 bales.
Medium wool	8,314 − 1,062 bales =	7,252 bales.
Strong wool	260 bales =	260 bales.

Second step.—The 7,252 bales of medium wool, however, contain considerable quantities of fine wool, since in many clips the fine wool is not kept separately but mixed with the medium wool. Consequently, we reduce the medium wool by a further 20 per cent., i.e. by 1,191 bales, and add the latter to the fine wool.

Third step.—We reduce our strong wool of the 64's type (260 bales) by 5 per cent, since also medium wool is contained in this strong wool, i.e. we deduct 13 bales and add these to the medium wool.

Our final determination of fineness is then as follows:—

Fine wool: 4,098 + 1,062 + 1,191 = 6,351 bales or 50 per cent.

Medium wool: 8,314 + 13 − (1,062 plus 1,191) = 6,072 bales or 48 per cent.

Strong wool: 260 − 13 = 249 bales or 2 per cent.

Fibre Length Analysis of Clips.

An analysis of the same 12,672 bales was also made in respect of length, as determined by the B.W.C. and the following figures were obtained:—

A length, $2\frac{3}{4}$ in. and more	3,369 bales or	26%
B length, $2\frac{1}{4}$ in. and more	6,362 bales or	50%
C length, $1\frac{3}{4}$ in. and more	2,622 bales or	20%
D length, $1\frac{1}{4}$ in. and more	299 bales or	2%
E length, under $1\frac{1}{4}$ in.	19 bales or	—

From these figures it appears that the wool grown in this area by no means conforms to the standard requirements set for 12 months'

growth. In this case too, the figures are misleading because, as in the case of fineness, wools of various lengths are mixed. The result is that when appreciable quantities of wool of B length are found mixed with wool of A length, such wool is typed as a B length.

As regards length, we reduce B class wool by 15 per cent. Naturally B wool has also been mixed with C wool, but since neither B nor C wool came up to expectations for a 12 months' growth, it is not necessary to reduce C wool. Consequently our final length classes will be as follows:—

A wool, 3,369 + 954 = 4,323 bales of 37%
B wool, 6,362 − 954 = 5,408 bales of 40%
C, D and E wool, the same as previously.

It is a striking fact that the area produces practically no strong wool of 60/64's quality. In fact, most strong wool was obtained from rams. A further remarkable fact is that the spinning count of the wool was practically only medium fine, and in view of the large quantity of fine wool, we cannot but expect that the length requirement will not be satisfied. On the other hand we find that practically 60 per cent. of the wool is of the B and C lengths.

From the above then it is clear that in order to obtain a bigger return per sheep, we must grow wool which is both light and of better length, i.e. the sheep will have to carry more wool instead of the 50 per cent. or more impurities, and the farmer will have to ensure as far as possible that the wool is not contaminated with dust and dirt. Scientific research has shown that a sheep yielding wool of 64's spinning count and having a skin surface of 10 square feet and 30,000 fibres per square inch produces 9 lb. of wool at 12 months' growth or 4¼ lb. scoured wool with a yield of 50 per cent. With 50,000 fibres per square inch the same sheep would have yielded 7½ lb. scoured wool—an increase of 3 lb. scoured wool on the original weight. (Ordinary flock sheep have from 15 to 20 thousand fibres per square inch and stud sheep 70 thousand fibres and more per square inch.)

Six-month wool.—The writer feels that he must mention something about six-month clips. It is apparently not a general practice to shear six-months' wool, but a few farmers in the grain area have done so this year. In almost all cases this short wool was sold as spinner's at an average price of 14½d. per lb. for wool of 1¾ in. (even 16d. per lb. was obtained for short wool from Harrismith). Although the writer is not much in favour of shearing wool at six months, this practice nevertheless indicates a step in the right direction, namely the production of a lighter wool in the maize-growing areas with a view to reaping the advantage of the higher price basis of the spinner's type. The writer would, however, recommend shearing at 8 months, e.g. in August, April, December, August. The breeding policy should aim at length of fibre with due regard to density and quality so that B-length wool of 2¼ in. may be shorn at 8 months' growth. By marketing wool measuring 2¼ in., farmers will obtain a 2 per cent. higher scoured yield than in the case of wool measuring less than 2 inches in length.

Class of Clips of Various Sizes.

At the beginning of this article it was indicated that in most cases we were dealing with small clips. It is impossible to endeavour to prescribe the correct classification for each clip, since so much depends on the quality of the wool and quantity of each type. It should, however, be remembered that length constitutes the basis of all wool classing. The lengths should be kept as uniform as possible and a difference between the degrees of fineness may only be made when such difference is justified by the quantity. In what follows

the writer wishes to indicate what he regards as a safe guide for most small clips.

Five bales and less.—Class medium and fine wool together. Any wool which is apparently too strong and does not match with these classes should be added to the ram wool. If the lengths are regular, the fleeces should be put together and the few short and/or tender fleeces should be added to C.B.P. If the difference in length is pronounced, first and second fleece lines should be made. The farmer should skirt all fleeces properly and keep backs separate. The following table reflects a few actual cases.

Number of bales.	Weight in lb.	Description.	Type.	Scoured yield %	Price per lb.
(1) 4	275	B M	47	47	$14\frac{3}{4}$d.
1	307	C B P	114	41	$10\frac{3}{8}$d.
		Lox and backs in bags.			
(2) 2	335	A F	47	52	$16\frac{3}{8}$d.
1	290	B F	52	51	$15\frac{3}{8}$d.
1.	152	T D R	88	50	14d.
1	235	C B P	113	47	$12\frac{1}{4}$d.
		Lox in bags.			

Ten bales and less.—In this case the first line may be divided into two classes, e.g. A M and A·F provided such division is justified by quantity and provided a marked difference exists. If not, the wool should be placed together and divided into first and second lines. In classing further, the same procedure should be followed as before. The following illustrations represent actual cases:—

(1) 3—352—A F : 7—55—19d.
1—334—B F : 52—52—$15\frac{3}{4}$d.
1—151—C.F. : 57—50—14d.
1—363—C B P : 113—48—$12\frac{1}{2}$d.
1—363—L O X : 135—38— $7\frac{3}{4}$d.

(2) 3—287—A F - 6—54—$19\frac{5}{8}$d.
1—320—B M : 51—50—$15\frac{3}{8}$d.
1—286—B K S : 57—48—$13\frac{5}{8}$d.
2—368—B P : 153—46—$11\frac{1}{8}$d.
1—457—L O X : 166—43— $6\frac{7}{8}$d.

Fifteen bales and less:—In this case even the second line may be divided into fine wool and medium wool, if necessary. The further process should be the same as that described above. If the farmer desires to make up a third line of short wool, he may add a few "ODD" and tender fleeces and mark it C.

N.B.—The backs should always be kept separate and even in the smallest clips the fleeces should be well skirted. Furthermore, it is important that the length should be determined whilst the wool is still spread on the table and not after it has been rolled, since the shoulder parts are usually longer and cover the shorter wool towards the rump.

Twenty bales and more:—Clips of more than 20 bales usually give less trouble. It is, however, important to remember that a class should only be made if the quantity of wool justifies such a step. If the farmer is afraid that he has not sufficient wool of a particular type for making a line, and that the wool may perhaps detract from his better lines, he should add it to a line where it can do least harm. The good old rule still applies, namely that a small quantity of superior wool can always be added profitably to a large quantity of

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The Argentine Ant.

Dr. J. T. Potgieter, Professor of Entomology, Stellenbosch-Elsenburg College of Agriculture.

THE activities of the Argentine ant (*Iridomyrmex humilis*, Mayr.) in and about dwellings and gardens are well-known, but the pernicious rôle which it plays in gardens, orchards and vineyards in giving protection to numerous important pests, is not so apparent.

About in 1901 this insect was first noticed in various parts of the Cape Peninsula and since that time has steadily increased in numbers and is also rapidly spreading inland. The danger that it may ultimately overrun the whole Union of South Africa cannot be sufficiently stressed, especially since it can no longer be regarded as only a serious pest of all the important coastal areas of the Union as its presence has also recently been established in parts of Johannesburg and Pretoria.

Not only are houses overrun and foodstuffs contaminated, but many forms of animal life, especially nestlings and young chickens, are frequently attacked and killed by the worker ants. In addition the nests of useful pollinating insects like wild bees and honey bees are also attacked and destroyed by these ants, a fact which accounts for the general scarcity of these insects in our orchards. The constant presence of ants in the trees and amongst the blossoms further tends to drive these pollinating insects away. Their presence also on such plants as squash and pumpkin during the flowering period will often prevent proper fertilization by direct damage to the flowers.

The most attractive food supply for the Argentine ant is the honey-dew secreted by garden and orchard pests such as aphids, scale insects, the Australian bug and the mealy bug. As a result of this association, the natural enemies of these pests are so persistently harassed by the ants that they cannot keep them in check.

Control.

If, however, proper ant control is carried out, then the natural enemies of such pests as mealy bug on vines and guava, and aphids on fruit trees and other plants, will often be able to control these pests to such an extent that other control measures need not be resorted to.

These insects remain active throughout the year and the queens continue to lay eggs, but during the winter months the ants are less active and less numerous, and colonies are then found in more sheltered positions. This period is generally more favourable for ant-control operations since the natural food supply of the ants diminishes during the winter months, and the insects are also more inclined to take the poisoned bait when the weather is cool. Persistent applications of the poison at regular intervals during winter and early spring as soon as the ants begin to become active again with the return of the warmer weather, will decrease their numbers to such an extent that it will be comparatively easy to keep them under control in summer, when they usually do not feed so readily on the poison, especially in orchards and vineyards. The most effective baiting season for the Argentine ant is therefore from late autumn until early in November. After this period, that is, during the hot dry summer season, they prefer the honey-dew of insects.

As a result of numerous experiments with different poisoned baits an ant poison has been developed and is now generally used. This bait is very effective and cheap, and can easily be prepared at home as follows:—

Mix 8 lb. of syrup with 4 pints of hot water in a clean tin. Then add 20 grams of sodium arsenite (about 4 level teaspoons) which has been dissolved in 1 pint of hot water. Stir the mixture well and add enough hot water to make *one* gallon of bait. The solution is then ready for use.

Sugar may be substituted for the syrup in the above formula. by adding 8 lb. of white sugar to 2½ pints of water and 5 grams (1 level teaspoon) of tartaric acid. This mixture must then be allowed to simmer for 45 minutes and a syrup of about the same consistency as the commercial syrup will be obtained. To this is added the 20 grams of sodium arsenite which has first been dissolved in 1 pint of hot water. Add enough hot water to this mixture to make *one* gallon of bait. After the solution has been well stirred, it is ready for use.

Caution.—This ant bait is highly poisonous and should be so stored and handled that children and animals do not have access to it. Special care should also be taken with the receptacles used in preparing and distributing the bait and these should not again be used for any other purpose.

Application of the Bait.

For use round about buildings and lawns the poison bait is simply poured into shallow tins or lids of tins which are placed on a piece of wood or a brick to prevent the ants carrying sand into them. The containers are placed near a stream of ants, the bait being renewed constantly until the ants disappear. In this way the ants will be controlled within a reasonably short period. The containers can be effectively secured by attaching them to a spike in the ground and covering them with a stone or other cover in such a way that animals and children cannot get at them, but so that the ants will have easy access to the poison. These containers should be cleaned regularly with hot water before renewing the bait.

To poison the ants on fruit trees, e.g. citrus, guava and peach trees and also vines, the bait should be applied in such a way that it does not spill or leak out of the container as the poison may injure the bark or roots. The bait should therefore be used and applied with care.

A cheap and useful container to which the ants will come readily, is an ordinary reed (spaansriet) about twelve inches long and ¾ inch in diameter. The first joint is used as the poison container and should be at least 2 inches long with two small openings about one inch from the top. These openings are cut or bored or burned through the reed to serve as entrance holes for the ants and allow them easy access to the bait. The large top opening is used for renewing the poison and is plugged with wood-wool or paper to prevent evaporation and to keep out dust. The reed can be securely fixed by simply pressing the lower end, cut to a point, into the soil in a slanting position so that only the top portion comes in contact with the tree or vine. The amount of bait used in the reed is about one large teaspoonful which generally lasts for about a fortnight to 3 weeks, but where feeding is heavy it may be necessary to renew the poison at shorter intervals. Before fresh poison is applied, however, the reeds must again be cleaned

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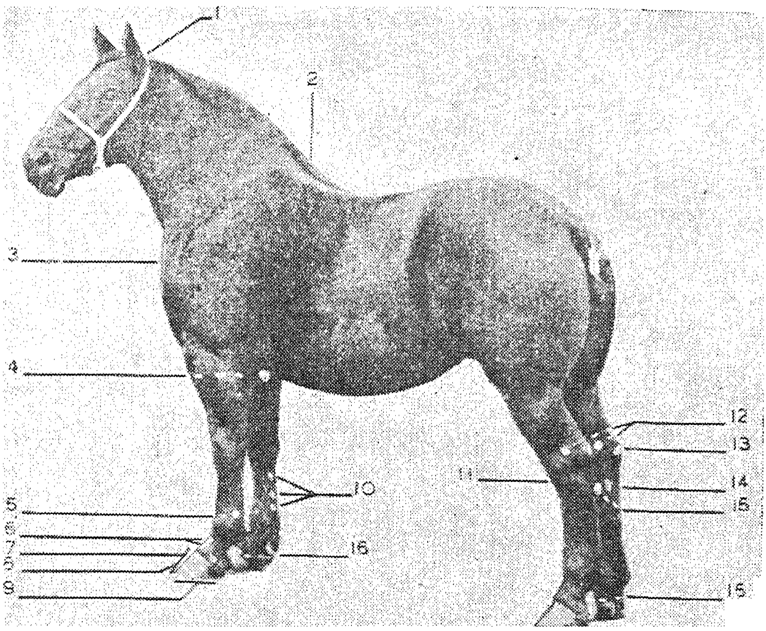
The Draught Horse.*

VI (a) Unsoundnesses and Blemishes in Horses.

Dr. L. L. Roux, Senior Professional Officer, and H. J. van der Merwe, Lecturer in Animal Husbandry, Grootfontein College of Agriculture, Middelburg, Cape.

SOUNDNESS may be defined as a state of health which allows a horse to perform efficiently the work for which it is intended by nature. Consequently, certain defects which would render a Thoroughbred incapable of doing the fast work expected of it, may have little or no effect on the work to be performed by the draught horse. Soundness is therefore a relative matter to be judged by the work to be performed.

The chief causes of unsoundness in draught horses alone will be briefly dealt with here.



Location of common unsoundnesses and blemishes.

1. Poll evil.
2. Fistula of the withers.
3. Breast boil.
4. Capped elbow (shoe boil).
5. Windgalls.
6. Ringbone (high and low).
7. Sidebone.
8. Sand-crack.
9. Laminitis.
10. Splints.
11. Bog spavin.
12. Thoroughpin.
13. Capped hock.
14. Curb.
15. Bone spavin.
16. Greasy heel.

Blemishes are various types of lesions which are not regarded as unsoundnesses; when large and unsightly, they detract from the value of a horse, but do not interfere with his capacity for work. Scars resulting from healed cuts, bony enlargements caused by kicks

* The information given in this article was extracted from notes kindly supplied by Dr. J. Quinlan, Assistant Director of Veterinary Services, Onderstepoort.

or bruises, when not interfering with normal movement, must be regarded only as blemishes; but blemishes which interfere with normal movement, such as scars on the flexor aspect of the hock, knee, or pastern, must be considered unsoundnesses in work horses.

The limbs are most frequently associated with unsoundness in draught horses. The cause lies in faulty conformation, such as light, soft bone, calf knees, "standing-over" or "standing-under", sickle hocks, too straight hocks, upright pasterns, too sloping pasterns, unproportionate hoofs, weak shelly horn, and turned-in or turned-out toes which cause irregular action and may result in brushing or stumbling. Faulty conformation of the body, other than that described in the case of limbs, is not usually a predisposing cause of unsoundness of the limbs, although it may lead to faulty action. Straight shoulders, for instance, may result in stumbling; long-backed light-bodied horses soon tire, and this also may result in stumbling and brushing.

Horses with good conformation are rarely affected with unsoundnesses of the limbs, unless they have suffered from mechanical injury. Even well-conformed animals, however, are not immune to abuses such as overloading, for example, more especially when they are very young, unfit or lacking in condition due to unsuitable or deficient rations. Deficiencies in phosphorus or calcium result in pathological bone development which renders horses susceptible to disease of the limbs, and even fracture.

According to the United States Department of Agriculture: "The following kinds of unsoundness are regarded by the Bureau of Animal Industry as sufficient to bar a mare from being bred to a Government stallion: bone spavin, ringbone, side bone, heaves, stringhalt, roaring, periodic ophthalmia (moon blindness) and blindness, partial or complete".

The logical assumption appears to be that these conditions, or rather the conformation which is predisposing to them, are hereditary. Conformation is undoubtedly hereditary but there is no reason why any of the above-mentioned diseases of the limbs on a well-formed leg should exclude service by a Government stallion: the conformation is hereditary and not the disease. Periodic ophthalmia, although very rare, does occur in South Africa, but, for practical purposes, it can be considered a negligible cause of unsoundness. Partial blindness caused by an injury should not affect a mare's usefulness for breeding, and such a condition should not cause her rejection for stud purposes. Heaves or broken wind (emphysema of the lungs) is not a hereditary condition and mares not badly affected can be successfully used for breeding. There has been a controversy about the heredity of whistling and roaring, but this has never been settled by experimentation or analysis of data assembled from the progeny of whistlers and roarers. Whistling and roaring are frequent sequelae to diseases such as biliary fever, pneumonia, strangles, etc., which cause high temperatures, and there would appear to be no valid reason for excluding mares from stud which are affected as a result of an acute febrile disease.

Types of Unsoundness.

The following are the more common types of unsoundness encountered in draught horses in this country (See illustration):—

(1) *Poll evil* is a fistulous condition of the synovial bursa abutting on the poll on the top of the neck. Not infrequently some neighbouring structures—ligaments, muscle, and bone—are involved in a necrotic process.

It is the result of injury and infection of the region of the poll, frequently caused by striking the poll against a low door.

There is abscessation followed by a purulent discharge. Since there is insufficient drainage, the abscess rarely heals spontaneously, and an operation is usually necessary to bring about recovery. It is advisable to have such cases treated early otherwise fatal sequelae may result.

(2) *Fistulous withers* is a fistulous condition in the region of the withers. It is due to injury and infection followed by necrosis Frequently neighbouring structures (bones ligaments, muscle, cartilage, and nerves) are involved. Abscessation is followed by a purulent discharge. Owing to insufficient drainage, healing rarely occurs spontaneously. An operation is usually necessary; postponement of the operation may result in fatal sequelae.

(3) *Breast boil* is a fistulous condition at the base of the neck, close above the shoulder joint. It results from collar injuries. Abscessation is followed by fistula formation. The underlying muscle is involved in a chronic suppurative inflammatory process. An operation is usually necessary to bring about a cure; postponement of the operation may result in fatal sequelae.

(4) *Capped elbow and Capped hock* are inflammatory conditions of the synovial bursae over the point of the elbow and the point of the hock. They are usually caused by direct injury to the bursae. Insufficient bedding in the stall is a very common cause of capped elbow, while kicking against the wall of the stall, or the truck during rail transport, often causes capped hock.

When these conditions are acute, lameness may be present, but when they become chronic, there is no impairment of a draft horse's working capacity. Consequently, chronic capped elbow and capped hock must be regarded as blemishes rather than as unsoundnesses. Fistulous conditions of either bursa resulting from abscessation following infection frequently require operative treatment to bring about a cure.

(5) *Windgall* is a distension with joint oil (synovia) of the tendon sheath at the back of the fetlock. It ocurs on both fore- and hind-limbs. The swellings, which are fluctuating, are seen on either side of the back tendons, just above the fetlock. This condition is a result of continuous hard work, although it may also be seen in young horses that have done little work. Windgalls do not as a rule cause lameness and must be regarded as blemishes only. In old horses, they sometimes cause restriction of normal movement and give the animal a stiff, proppy gait.

(6) *Ringbone* is a bony enlargement involving the pastern or pedal joints. The former is called high ringbone, the latter low ringbone. The condition is probably more common on the fore-limbs of draught horses than on the hind-limbs. It may be confined to the ligaments of the joint (periarticular ringbone), or the joint cartilage may be involved (articular ringbone). Ringbone need not necessarily form a ring around the joint. It may be on either side, in front, or, more rarely, behind the pastern. There is a certain amount of restriction of normal joint movement; consequently, a horse suffering from ringbone is nearly always lame and of little use except for the slowest work. Horses suffering from articular ringbone always show a severe lameness and cannot be worked.

As is the case with most other diseases of the limbs, ringbones occur on horses with faulty conformation, e.g. short, straight pas-

terns, and very long, sloping pasterns. Strain from bad shoeing or over-exertion may be the immediate cause.

(7) *Sidebone* is due to the lateral cartilage of the foot being gradualy transformed into bone. These lateral cartilages play an important rôle in the anti-concussion mechanism, and their transformation into bone causes inflexibility. Sidebone is a common disease of draught horses, and, if the hoofs are small, is a most serious condition. In wide, open hoofs, it is not quite so serious, and horses can do slow work for a long time without showing lameness. Horses with sidebone require the most careful attention to prevent the development of "boxy foot". There is a tendency for the heels to become narrow and high and the frog to atrophy. This can be prevented by careful shoeing.

Sidebone is usually found on the fore-limbs only; it is very rare in the hind-limbs.

The condition is frequently the result of an injury to the coronet in the region of the lateral cartilage, but short pasterns and small narrow feet are a predisposing cause.

(8) *Sand-crack* is a crack in the wall or sole of the hoof, which runs parallel to the horn fibres. It may extend from the bearing surface of the hoof to the coronet, or its extent may be limited. The crack may reach the sensitive tissue, or it may be superficial.

Lameness occurs when the crack is complicated and reaches the sensitive structures of the hoof.

A sand-crack is most frequently seen in dry, brittle horn and, consequently, it is always a serious condition until the cause is removed and the crack successfully treated.

(9) *Laminitis* is an inflammatory condition of the sensitive laminae of the foot. When the acute condition passes off, a chronic laminitic foot frequently results as a sequel. Such feet are easily recognised. The sole is convex, especially at the point of the frog; the horn shows irregular rings; the wall at the toe is concave; the heels are usually high; the coronary line presents an uneven outline; the frog is frequently atrophied; the hoof shows a tendency to grow long and narrow; and the horn is dry and brittle. Lameness is nearly always present, especially on hard uneven ground. Chronic laminitis is a serious unsoundness. Palliative measures produce an improvement, but an affected animal will not stand hard work.

(10) *Splints* are bony growths situated on the splint bones. In the fore-limbs they are usually seen on the inside of the cannon. On the hind-limbs they are rare and usually situated on the outside, being the result of mechanical injury. Splints on the fore-limbs are seen on light-boned horses and are the direct result of sprains of the ligament attaching the splint bone to the cannon bone. The strain results from concussion, bad shoeing, and uneven ground.

As a rule, splints cause acute lameness when they are developing, but this usually disappears when the bony callus has formed. Splints not interfering with normal movement by pressing upon tendons or the knee joint, and not causing lameness, must be regarded as blemishes only and are not an unsoundness. Very large splints on the inner aspect of the cannon should always be considered an unsoundness as they are in danger of being injured by the opposite hoof during movement.

(11) *Bog spavin* is an inflammation of the hock joint (tibiotarsal joint). The capsule becomes filled with synovia and the hock has a puffy, soft appearance. The main swelling occurs just below the prominent point on the inner aspect of the front of the hock, and

there are two smaller swellings, one on either side. On pressure of the large swelling the other two become more prominent, so that it is sometimes called " crossgall ", which is a more appropriate name. Bog spavin does not always cause lameness, but there is a danger of the condition becoming acute and causing lameness as a result of severe strain. Consequently, the condition must be considered a serious unsoundness.

(12) *Thoroughpin* is an inflammation of the tendon sheaths at the back of the hock. Two main sheaths are involved: one above the hock where the swelling occurs on either side of the large tendon, and another just in front of the bone forming the point of the hock. The latter swelling may extend down the inner side of the hock to the chestnut. The swellings are soft and fluctuating. On flexion of the hock, they become very soft and more tense when weight is placed on the limb. Thoroughpin may be concurrent with bog spavin. The former is seen mostly in horses with small, straight hocks and long sloping pasterns. It may or may not cause lameness, but, owing to the danger of the inflammation becoming acute as a result of strain during work, it must be considered an unsoundness.

(13) *Capped hock*: See under " Capped elbow " (No. 4).

(14) *Curb* is a sprain of the tendons or ligaments at the back of the hock just above its lower extremity. It occurs in horses with weak, sickle hocks. The condition is seen by standing beside the hind-limb when the projection can be seen breaking the straight line running between the point of the hock and the fetlock. Curb is the result of strain. At first it is an acute inflammatory condition causing lameness. Later the lameness disappears, but the tendon callus which remains after the acute inflammation subsides, is always a weak point. The condition is likely to recur as a result of strain; consequently, curb is usually a serious unsoundness.

(15) *Bone spavin* is a bony enlargement on the inner aspect of the hock, towards the lower extremity and in the front of the middle line. It occurs in horses with weak or sickle hocks, although occasionally it occurs on a well-shaped hock. The direct cause is strain on the small hock-bones and the joints which they form. Spavin is best seen by comparing the hocks from the front, while manipulation with the fingers will confirm the diagnosis. Spavin is a most serious unsoundness, and in the great majority of cases it is associated with lameness. Occasionally horses with good hocks become sound after the bony callus has developed. Horses with bad hocks rarely become sound, and, if they do, lameness frequently recurs when they undergo the strain of work.

(16) *Greasy heel* is a chronic or exudative inflammation of the skin of the lower part of the limbs, most usually at the back of the pastern and fetlock of the hind limbs.

The disease appears to be constitutional—some local manifestation of a systemic defect, which becomes evident when suitable environmental conditions exist. It affects chiefly the heavy breeds of horses, especially those with marked " feather ". It is associated with unhygienic stable conditions, lack of suitable exercise, dirty badly drained stables, and working in muddy places. It is frequently concurrent with the hoof diseases " thrush " and canker, which arise under similar environmental conditions. One attack leads to recurrences. Repeated attacks cause a chronic thickening of the affected limbs, " elephantiasis ", which must be considered an unsoundness. To avoid recurrences, the environmental conditions under which it develops must be removed.

Respiratary Unsoundnesses.

Roaring and whistling.—These conditions cause respiratory distress when a horse is called upon to do hard work. The cause of the condition is a paralysis of one or both vocal cords, but almost always the left. The cause of the paralysis is a degeneration of the recurrent laryngeal nerve which supplies the muscles of the larynx. Whistling and roaring are looked upon as hereditary conditions, but this has not yet been proved by research. They frequently follow an attack of any acute disease causing a high temperature, such as strangles, pneumonia and biliary fever. Consequently, horses that suffer from a disease associated with a high temperature should be allowed a long period of convalescence.

The abnormal sound occurs during inspiration only, when the horse becomes distressed. It varies in intensity from a slight whistling to a hoarse, roaring sound. The condition is detected by giving the horse fast work or, in the cases of draught horses, by putting them to pull a load. In serious cases it can be brought out by fast trotting. The disease is slowly progressive: it begins as whistling and ends in roaring. Whistling and roaring horses cannot do heavy work. Consequently, both of these unsoundnesses must be regarded as serious.

The question arises whether it is a sound policy to breed from affected animals. Most horse-breeding improvement societies will not except whistling and roaring mares for service by their stallions. However, the matter is still controversial and there is no sound reason for excluding mares which have become affected as a sequel to some acute respiratory or constitutional disease.

Heaves or broken wind.—The disease emphysema of the lungs is a chronic condition. It occurs more especially in the heavier breeds of horses. It is characterized by difficulty in expiration and a chronic wheezy cough. It may be caused by continuous heavy or fast work. The condition usually follows a chronic cough during the winter, when horses have been eating dusty hay. There is a double expiratory effort which can be noticed particularly in the muscles of the flank. The nostrils are slightly dilated. The horse eats well, but remains unthrifty. The distress is exaggerated by feeding bulky material. It is an incurable condition and in time the animal becomes worthless. Broken-winded mares can be used for stud, unless the symptoms are exaggerated.

VI (b) Diseases of Horses.

Certain diseases of horses, especially horse-sickness and dourine, have greatly inhibited the progress and extension of horse breeding in South Africa. The following notes upon these two diseases are intended to act as a warning, especially to beginners. Advice and assistance upon these and all other horse diseases can be obtained from the Director of Veterinary Services, P.O. Onderstepoort, Pretoria. Valuable animals may be lost if the precautions recommended are not observed.

Horse-sickness.—The following information on the disease has been obtained from the text "Animal Diseases in South Africa" by M. W. Henning, Professor of Veterinary Science, University of Pretoria.

Horse-sickness is a specific disease of equines; horses are most susceptible, mules are more resistant, while the majority of donkeys are completely immune to natural infection.

Evidence suggests the possibility of transmission by a noctural insect. Recent investigations point to *Culicoides* as being probably involved in the transmission of horse-sickness. (See *Farming in South Africa*, July 1944).

The disease is confined to the summer-rainfall areas and is most prevalent during wet seasons.

The disease occurs most extensively in the lowveld and bushveld of the Transvaal, in Natal and in the eastern Cape Province. The western, southern and north-western parts of the Cape may be considered free from the disease. The remaining areas, the highveld of the Transvaal, the Orange Free State and the northern and north-eastern Cape, are normally comparatively healthy for horses, but horse-sickness has been found to occur in these areas and to cause serious losses.

Normally, the disease makes its first appearance during January or February, although the most serious outbreaks generally occur during March and April, but they may be even later if late rains are experienced. The disease disappears about 9 days after the first frost.

Infection occurs when susceptible animals are exposed during the night, low-lying parts, vleis, swamps, etc., being the most dangerous places.

It is thought that individual animals may have varying degrees of resistance which, again, may vary with the strain of the virus present. Animals which have recovered from a natural infection are referred to as being " salted ". An immunity to horse-sickness, whether acquired as a result of natural exposure or artificial infection, is generally of a very inconsistent nature, a considerable percentage of the animals being liable to contract the disease more than once.

Affected horses should not be exerted; they should be well nursed, protected from extremes of cold and heat, and given plenty of fresh water and suitable feed.

Chances of infection may be minimized by keeping horses in the stable between sunset and sunrise, stabling only in high lying parts, housing in mosquito-proof stables, and also by dressing the coats of horses with some insect repellent such as paraffin.

Horse-sickness vaccine has been used extensively for many years. More recently, very considerable improvement has been brought about by the inclusion of several strains of virus as first reported by Alexander (1936), and the development of the new Polyvalent Mouse Neurotropic vaccine, the result of which on large numbers of horses and mules was first reported by Alexander, Neitz and du Toit (1936). Since the first issues, the vaccine, has been improved by the inclusion of newly discovered strains of horse-sickness virus from various parts of the country (H. Theiler, 1938). Breeders in horse-sickness areas are strongly urged to vaccinate all horses annually. The vaccine is prepared by the Director of Veterinary Services, P.O. Onderstepoort, and is issued only during the period 15 June to 15 December of each year. Vaccination is a simple operation; it can be undertaken by horse-owners themselves. It is most important, however, that the directions for use issued with the vaccine are carried out in detail.

Dourine.—The dangers of the further spread of dourine in South Africa were pointed out by Drs. Robinson and de Kock in *Farming in South Africa*, July, 1938.

The disease is described as a contagious venereal disease of equines. It is caused by a microscopic parasite which is transmitted from animal to animal by copulation. The first symptoms appear in the genital tract; the parasites then enter the bloodstream and, eventually attack the nervous system where paralysis results and death follows. The course of the disease may take a year or longer; the danger of infection exists during the earlier stages. Also, animals may have a latent type of dourine and such cases are particularly dangerous in spreading the disease. It is further stated that since treatment is of no avail, it is hoped that farmers all over South Africa will co-operate with Department of Agriculture and Forestry in its attempt to eradicate or control this insidious and dangerous disease wherever it may be found to exist.

Any suspicion of the disease should be reported immediately. Farmers should take every precaution against introducing the disease to clean farms, especially through infected stallions which may appear clinically healthy and yet harbour the parasites. In infected areas, only stallions that have been properly tested should be used on clean farms. On the other hand, infected mares showing no clinical symptoms can infect clean stallions, and in this way the disease may spread without the knowledge of the owner.

Searchlight on Wool from the North-Eastern Free State :-

[Continued from page 630

inferior wool but that a small quantity of inferior wool should never be added to a larger quantity of superior wool.

Finally, he should avoid over-classing, i.e., he should not attempt to 'split hairs', or remove the very best fleeces if such procedure will detract from the value of the clip as a whole, for such a step will definitely not be remunerative.

Uniformity of Flocks Essential.

The writer again wishes to emphasize that if sheep-breeders would concentrate more on classing their flock annually, they would find that many of the difficulties with which they have to cope in classing their clips would disappear. A breeder should aim at a uniform fleece on each sheep as far as length and fineness of fibre are concerned, i.e. he should have in his mind a picture of an ideal sheep, and in buying rams, he should ensure that his ideal will be maintained or even improved upon. In classing his ewes, he should eliminate all undesirable animals and use only the best for breeding.

Moreover, it will also be necessary to class the hamels annually with a view to obtaining a uniform wool clip. Hamel lambs which will probably never develop into useful animals, should be culled at weaning. Thereafter the remaining hamel lambs should again be classed at 2 tooth so that all sheep which have undesirable wool characters, may be finally eliminated.

The secret of uniformity in wool clip is thus to be found in the following factors:—

(i) the buying of good rams;
(ii) the annual classing of ewes;
(iii) the annual classing of hamels as indicated.

Literature.

H. B. Carter in "Australian Pastoral Review", 1942.

Powdery Mildew or Oidium-Disease of the Vine.

Dr. S. J. du Plessis, Research Officer, Western Province Fruit Research Institute, Stellenbosch.

This powdery mildew disease is sometimes called " wingerdsiekte ", a name which is characteristic of the extent to which this condition is known. The disease was probably introduced into South Africa shortly after the middle of the nineteenth century, presumably from European vines which shortly before had been almost fatally attacked by this disease.

In various parts of the world a particularly large number of articles have already appeared and a large number of compounds have been recommended for the control of the disease. In most of the earlier articles written in South Africa on this subject, sulphur was recommended as the best fungicide and various factors which might influence the effectiveness of this material, were mentioned. Gradually

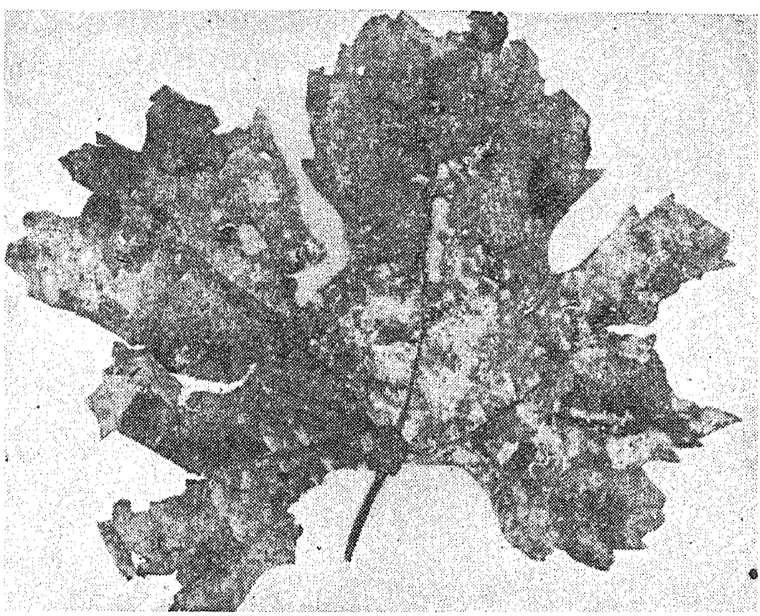


FIG. 1.

the regular habit of annually treating their vines, especially the more susceptible varieties, with sulphur began to take root amongst farmers.

Various problems in connection with the control of the disease presented themselves and, as a rule, the growers formed their own opinion and proceeded on the assumption that it was correct. The problem of *oidium* control was made still more difficult as a result of the fact that an increasing number of fungicides, some of which were said to give better results than the old approved sulphur treatments were put at the disposal of the wine-farmer. In order to obtain a clear view of various problems which presented themselves in connection with *oidium* control, special attention was paid to

this disease for a few seasons and a number of experiments were carried out on vines of Stein, Waltham Cross and Riesling varieties in the areas of Bottelary, Banhoek and Groot-Drakenstein.

FIG. 2.

Symptoms of the Disease.

In South Africa the fungus seldom manifests itself in the form of seriously harmful symptoms in the vine leaves. In the first stages the disease spots are of a lighter colour and the leaf surface of these spots is covered with a fine, whitish growth, which is in most cases visible only when the leaf is held against the light. Where the powdery mildew occurs severely the leaves show a tendency to become curly and the surface of the affected leaf parts then appears clearly white as if sprinkled with flour (Fig. 1). This appearance is due to the fact that the fungus normally grows on the outer side of the leaf and forms spores which fall in large numbers on the leaf surface. Badly affected leaves show a tendency to fall off early. Under conditions of fairly regular treatment, vine-leaves which are badly affected with the disease, are seldom found during the earlier part of the season. Usually, however, *oidium* occurs in an increasing degree on the leaves after the harvest and in areas which are favourable for the disease. Almost all the leaves of susceptible varieties are effected during late autumn.

The powdery mildew spots are much easier to detect on the young

shoots. At first a fine white powdery growth is noticeable in the form of irregular, round darker spots. The fungus cover then grows denser and afterwards turns more mealy white. If this cover is wiped off it will be found that the green surface of the shoot shows fine, striped, brown discolourations which usually radiate from the centre to the circumference of the spot (Fig. 3).

This peculiarity is the most specific characteristic of the disease and an important contributory factor in detecting the condition on the brown wood during the ensuing winter (Fig. 4). These spots on the shoots are always superficial and never penetrate deeper than the bark. If the spot-infected dry bark is stripped off during the winter, the infection is removed altogether.

Fig. 3.

In isolated cases young shoots sometimes are so badly affected by the disease as to be entirely covered by the fungus. In such

severe infections it is difficult to recognize the separate spots. The general influence of the disease manifests itself in the poor growth of the shoots which remain slender and sooner or later die.

The disease is most feared when it attacks the harvest, but infection may take place even before the flowering stage. On the young flowers and berries the white fungus cover only is noticeable,

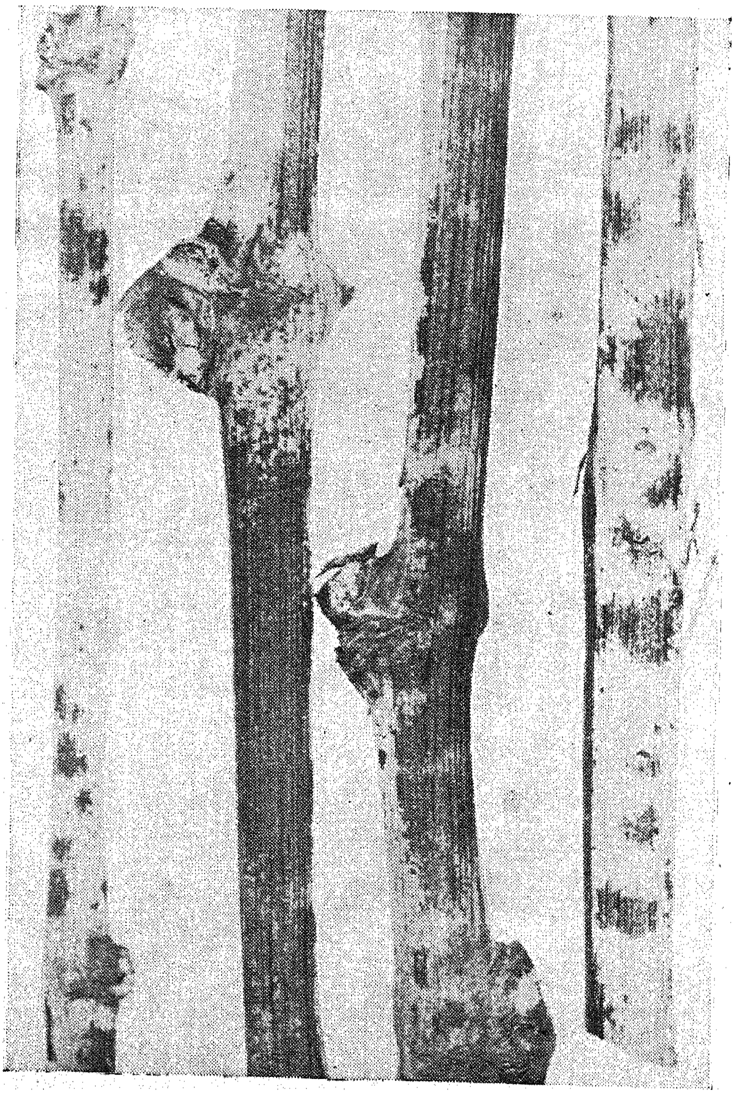


FIG. 4.

and if the disease is not controlled in time, the berries drop comparatively early. On older berries spots are formed which are similar to those on the shoots. If the spots are situated on one side of the berry, the growth of the outer skin is so impeded by the fungus that it cannot further develop to the same extent as the rest of the berry which consequently becomes deformed or, in severe cases, cracks (Fig. 2). The cracks usually appear when the berries rapidly

enlarge immediately before the colour appears. This condition is often followed by considerable secondary rotting and is further aggravated by the activities of vinegar flies. The ultimate result is that only the dry skins of the berries remain on the vine.

Occurrence of the Disease.

In the winter-rainfall area it seldom happens that *oidium* appears in vines before the middle of November. This phenomenon is due to the particular requirements of the causal fungus, which cannot develop or cause infection in the absence of a high humidity. It is, however, peculiar in that its spores do not germinate in water. This indicates that the fungus spores will not germinate and cause infection during dew or rain periods, but rather during the damp periods which precede or follow dew or rain.

Furthermore, the fungus requires moderately warm weather conditions. The comparatively cold weather of spring, when the humidity is usually high, is too cold for the fungus. On the other hand, the scorching heat of midsummer, when it is usually fairly dry, is too warm for the fungus.

Favourable conditions do, however, occur from before the beginning of November until during January, i.e. moderately warm, sultry, weather. Fortunately, however, the berry only remains susceptible to infection until its colour begins to appear which in many varieties takes place early in December. The most critical period for *oidium* infection is, therefore, from the beginning of November to the middle of December. It will, however, later be indicated that this does not mean that the vines need only be treated during this period.

Instances are also known where vines, owing to their situation on the northern side of a wall or avenue on which the sun could bake, were badly infected with mildew as early as the beginning of October. It is necessary that every grower should make a thorough survey of his particular circumstances to determine what infection period is the most critical in each particular vineyard.

Control Measures.

(1) *In the winter.*—As far as the control of *oidium* is concerned, a certain amount of doubt has arisen as to the desirability of spraying vines with a strong fungicidal mixture. Closely connected with the problem of the efficacy of this treatment, is that of the hibernation of the disease-causing fungus. Various workers have claimed that the fungus hibernates in the form of resistant hyphae under the bud scales; others again believed that the fungus did not hibernate on the vines at all.

Some research workers obtained promising results with applications of various fungicides during winter. Most, however, agreed that the spraying of vines during winter had no visible effect on the disease.

The data obtained on the Groot-Drakenstein experiment farm with Riesling, and represented graphically in Fig. 4, clearly indicates that winter spraying with lime sulphur (1 in 8) (treatment 1—23. 9. 40) had no decreasing effect on the incidence of the disease. This finding was repeatedly confirmed by results of experiments carried out during the seasons from 1939 to 1942 on Bottelary, Banhoek and Groot-Drakenstein.

Although the winter treatment produces a slight improvement when followed by sulphur treatments during the ensuing summer,

there appears to be no justification for recommending it as a specific measure for controlling *oidium*.

(2) *Choice of fungicide—Sulphur.*—In some circles it has been alleged that some of the mixtures containing copper are just as effective against *oidium* as sulphur. The copper-sulphur mixtures especially, have been regarded as promising, not only for controlling *oidium*, but also such diseases as anthracnose.

The following fungicides have carefully been tested out against one another: Bordeaux, a manganese-sulphate-lime mixture and sulphur. Without exception the ordinary vine sulphur proved much better than any other fungicide. The results in this connection are so outstanding that the use of anything else instead of sulphur for *oidium* control, is definitely not to be recommended.

After this determination of the outstanding control qualities of sulphur, there were a few striking aspects in connection with sulphur applications which merited special attention. These were investigated separately and the findings were briefly as follows:—

(*a*) *Influence of Lime.*—There were many growers who were convinced that lime, even when applied in an unmixed form, was almost just as effective against *oidium* as sulphur. Lime has the further advantage of being much cheaper than sulphur.

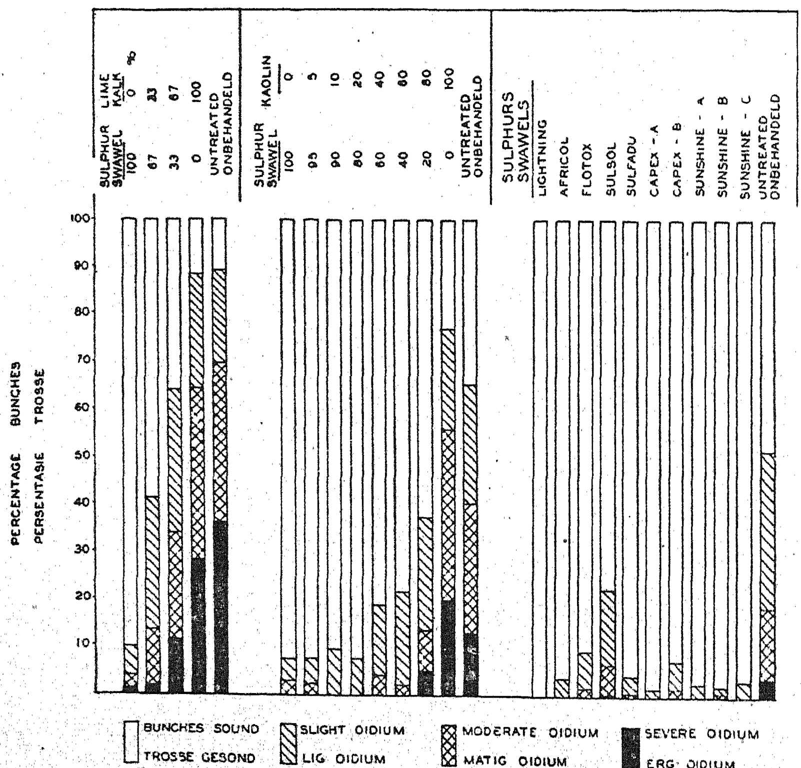


FIG. 5 FIG. 6 FIG. 7

This problem was investigated by using, for the customary summer applications, four different mixtures which had already been proved to be effective against the disease. One series of vines was dusted with fresh fine slaked lime; another with unmixed "Lightning" sulphur; yet another series with a dry mixture of lime and sulphur (1 part of lime well mixed with 2 parts of sulphur), and a fourth series of vines was dusted with a dry mixture of 2 parts

of lime to 1 part of sulphur. At harvesting-time every bunch of the specified vines was examined and grouped according to the degree of *oidium* infection. These experiment results are represented in Fig. 5. They very clearly reveal that lime-treatments are not only totally ineffective againt *oidium*, but also that additions of lime to sulphur lower the fungicidal efficacy of the sulphur.

(*b*) *Dilution of Sulphur.*—The general conclusion which was arrived at after years of contact with wine-farmers, is that most farmers are inclined to apply sulphur too lightly and in many cases disproportionately. This habit probably originates from the assertion that sulphur under the influence of sunlight and heat is transformed into a gas which has fungicidal properties.

Furthermore, a tendency has developed in the commercial world to put sulphur products of the highest degree of refinement at the disposal of the farmer. Now-a-days it is no exception for a vine sulphur with a sulphur-content of 99·0 per cent. or even higher to be offered for sale. This refinement of the product always entails an increase in price.

In order to throw more light on the above-mentioned problems, an experiment was carried out in which "Lightning" sulphur (99 per cent. sulphur content) was diluted in various degrees with an inactive substance, namely kaolin or fine white clay. Each of the dusting mixtures was thoroughly appied to a series of vines at three different periods, viz., 13.10.1941, 11.11.1941 and 9.12.1941. At harvesting time each individual bunch was again carefully examined and grouped according to the degree of *oidium* infection.

The results, as given in Fig. 6, indicate that kaolin had no effect on the disease. Furthermore, it is clear that dilutions of sulphur, even with 20 per cent. kaolin had no weakening effect on the fungicidal efficacy of the sulphur. Larger additions of kaolin definitely weakened the sulphur although not to the same degree as lime.

From this it may be concluded that, provided the applications are thorough, it is not necessary to use the particularly refined sulphurs. Because of a general tendency of underapply, it is regarded that sulphur-mixtures for general use must not contain less than 90 per cent. sulphur. Mixtures up to 80 per cent. sulphur are allowed only if care is taken to spread the sulphur well over all the vines.

The results further indicate that a minimal amount of sulphur must definitely come in contact with the vines, if the treatment is to be effective. There seems to be ground for urging farmers not to rely too much on the influence of sulphur applied from a distance. Fewer but more thorough applications are preferred to six or seven short successive but weak treatments. In the end fewer but more thorough sulphur applications mean that material, labour and time are being saved.

(*c*) *Choice of Sulphur.*—A considerable degree of uncertainty existed amongst farmers as to what type of sulphur was the best to use against *oidium*. A number of the most popular sulphur mixtures were compared with one another, and the results are graphically illustrated in Fig. 1.

From this it appears that no difference worth mentioning existed between any of the sulphur preparations used in the experiment. There were definite differences to be noticed in the dusting properties of the various preparations, and with some preparations vines could only be satisfactorily covered with sulphur at the expense of conside-

rable labour and loss of time. For general guidance the following easily-determinable requisites may be regarded as standard requirements for sulphur which is offered for sale:—

(i) It must contain at least 90 per cent. of sulphur, (ii) must not tend to form lumps, (iii) must lend itself to dusting and, preferably, easily form a cloud of sulphur, (iv) must be as fine as possible, and (v) must have good adhesive qualities. If a sulphur complies with these requirements, it is fairly certain to be effective if applied correctly.

Essential Treatments.

The uselessness of winter treatments has already been pointed out. For the summer treatment various workers have already made the hypothesis that because the *oidium* fungus lives on the surface of the vine, dusting can be delayed even until the disease becomes visible.

The experiment results as represented in Figs. 8 and 9, clearly indicate that the early sulphur applications, i.e. during October and

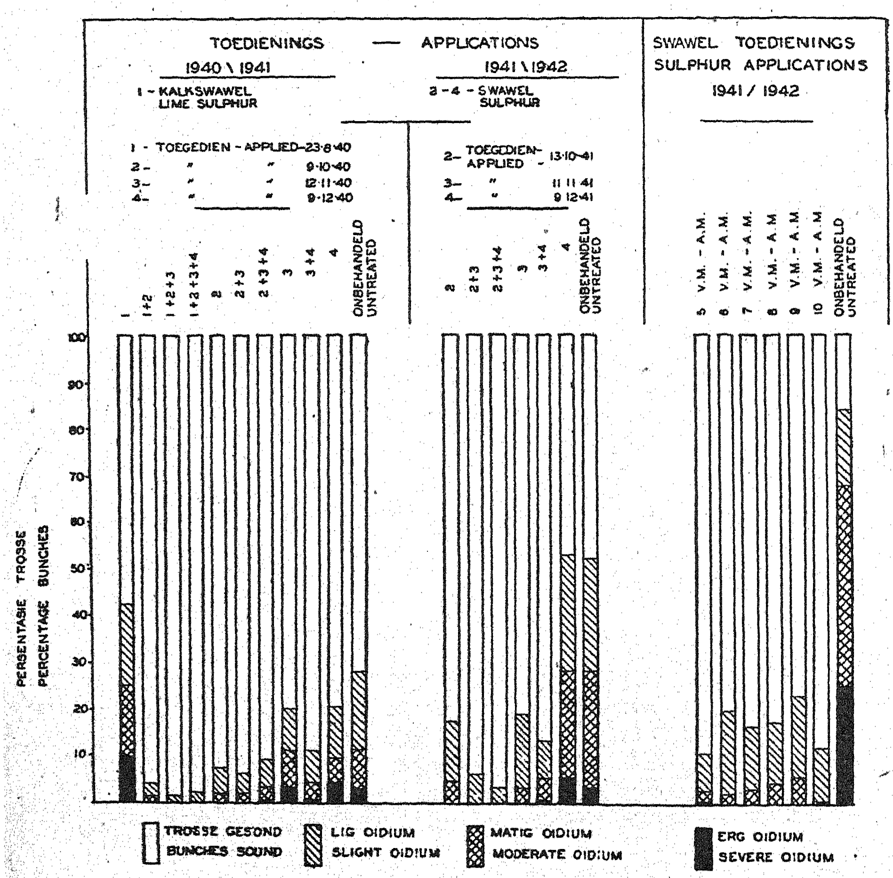


FIG. 8. FIG. 9. FIG. 10.

November, were in any case the most valuable. Therefore, although the disease as already indicated, normally only occurs from the middle of November, it is best controlled by starting early with the sulphur treatments.

 [*Continued on page* 668.

Arsenical Poisoning in Stock.

Dr. Douw G. Steyn, Onderstepoort.

AS a result of the extensive use of arsenical preparations in the destruction of locusts and as a dipping-fluid in the Union, numerous cases of stock poisoning occur annually. This is to a very large extent due to the careless handling of arsenical preparations. It is the duty of every person concerned to keep such a virulent poison as arsenic under lock and key, but it has come to our notice that it is a general practice among farmers not only to store arsenic in such a way as to allow anybody access to it, but also to keep it in the same room with animal feeds and licks as well as human foodstuffs. Needless to say, this is an extremely dangerous practice and has been the cause of many cases of poisoning both in man and animal.

Grazing Sprayed with Locust Poison.

It has been a common belief that grazing freshly sprayed with solutions of sodium arsenite according to instructions issued by the Department of Agriculture (namely, 110 to 120 gallons of a 0·6 per cent. sodium arsenite solution per acre) is safe for stock. This is by no means the case. Experiments conducted at Onderstepoort have proved that such grazing is extremely dangerous to stock until heavy rains have fallen on it and washed away a large amount of the arsenic. We have also proved that sprayed veld is still very dangerous even up to six weeks and longer after spraying if no rains have fallen. Our advice to stock farmers is therefore not to graze any stock on sprayed veld until at least 5 inches of rain have fallen on it. Heavy rains are much more likely to wash away the arsenic from the grazing than are mild rains. It is a very dangerous practice to allow stock on to sprayed grazing after mild rains when small pools of water are likely to collect on the veld. On no account should stock be allowed on to sprayed areas unless rains which cause a free rush of water, have fallen.

If spraying operations are followed by long rainless periods (months) or droughts, it is advisable to burn the grazing before allowing stock on to the sprayed areas.

The present method of destroying locusts, namely, by means of bait impregnated with sodium arsenite, is much safer than spraying. Those concerned should be warned, however, that the broadcasting of the bait should be done strictly according to instructions in order to avoid the possibility of lumps of bait lying about in the veld. On the other hand, the broadcasting of excessive quantities of bait should be warned against for two reasons. Firstly, stock may be able to pick up poisonous quantities of it, and, secondly, after the first rains, if these are not heavy, pools of water on the treated areas may contain dangerous quantities of arsenic.

Symptoms of arsenical poisoning.—These vary in peracute, acute, and chronic cases of poisoning.

(*a*) *Peracute cases.*—Death occurs very suddenly when animals ingest very large quantities of arsenic, especially when it is in solution. In such cases animals may die within a few hours. The only symptoms present in peracute cases are pronounced laboured breathing, cyanosis, very weak and fast pulse, subnormal temperature, muscular tremors (shivering) and collapse and death. In most cases the animals are found dead.

(*b*) *Acute and subacute cases*.—In these cases we see symptoms of arsenical poisoning as they are known to farmers, namely, pronounced and even haemorrhagic diarrhoea, jaundice, loss of appetite, excessive thirst, rapid loss in condition, laboured respiration, apathy, pronounced weakness in the hindquarters, paralysis, muscular tremors or clonic spasms may be present, and a weak and fast pulse. Pregnant animals may abort. Death may occur from within one to about fourteen days. The urine may be dark brown in colour.

(*c*) *Chronic cases*.—These are usually the result of ingesting arsenic repeatedly in small quantities over short or long periods. The symptoms may be the following: loss in condition (cachexia), loss of hair, eczema (usually dry and scaly), anaemia, general weakness, alternating diarrhoea and constipation, enlargement of the joints, and pregnant animals may abort.

Post-mortem appearance.—(*a*) In *peracute cases* there may be no specific lesions to be seen. In some cases large red patches (congestion and haemorrhages) are present in the ruminal and reticulum wall. These can best be seen when the stomach contents are washed off and the wall of the stomach is held up against the sun. There is usually congestion of the lungs, liver, and kidneys.

(*b*) *Acute cases*.—Here we see pronounced inflammation, and in many cases haemorrhages in the mucosa of the abomasum (fourth stomach) and the intestines, especially the small intestine; jaundice may be present, ulceration or erosions on the mucosa of the abomasum and small intestine, fatty degeneration of the liver (greyish or yellowish) and congestion of the lungs and liver in some cases.

(*c*) In *chronic cases* there are cachexia, anaemia, subacute or chronic catarrh of the abomasum and intestines with haemorrhages and ulceration of the mucosa in some cases, cirrhosis (hardening) of the liver and the kidneys, loss of hair, and enlargement of the joints in which there may be erosions.

Treatment of Cases of Arsenical Poisoning.

Experiments have been conducted at Onderstepoort in order to determine the most effective antidote in cases of arsenical poisoning. It was found that the time-honoured method of treating such cases with freshly prepared ferric hydrate is a waste of time. Of all the drugs tested, sodium thiosulphate (hypo) proved to be the most valuable. If affected animals are treated in the manner and order as described in this article many of them will be saved.

1. If arsenical poisoning has broken out in a herd or flock, the animals should be disturbed as little as possible, since any form of excitement will precipitate symptoms of poisoning and aggravate those symptoms, which have already set in. The provision of shade is a very essential point in the treatment of affected herds or flocks, but affected animals should not be driven over long distances, especially in hot weather.

2. The herd or flock concerned should be kept away from water for a day or two, until it can be estimated to what extent poisoning has taken place. Affected animals should be treated as below and kept away from water for two or three days. *N.B.*—Animals suffering from severe diarrhoea should be given small quantities of linseed or barley decoctions (for horses and cattle, according to age and size, 2 to 8 pints per day, and for sheep and goats 6 ounces to 2 pints) since it is essential that the large quantity of fluid lost through purging should be at least partly replaced.

3. As soon as it is noticed that the animals are ill they should immediately be treated with sodium thiosulphate (hypo). The best

results are obtained when it is administered both by the mouth and intravenously. Each beast could be given, according to age and size, one desertspoonful to two tablespoonfuls, dissolved in about one-quarter to half a pint of water, by the mouth. At the same time, 30 to 150 grains (2 to 10 grams) of hypo should be dissolved in about 10 to 50 c.c. of water and injected into the bloodstream. *N.B.*—The hypo-solution should be boiled for three minutes and then allowed to cool down to blood-heat before injection.

The dose for the horse is the same as that prescribed for cattle, while for sheep and goats it is one-quarter of such dose. This treatment could be applied once daily, if necessary.

4. Very strong black coffee should be given as a heart and central nervous system stimulant (8 ounces to 2 pints three times daily for horses and catle according to age and size,and 2 to 8 ounces for sheep and goats). Six tablespoonfuls of sugar should be added to each pint of black coffee.

5. Affected animals should immediately be given raw linseed oil as laxative, whether thay are purging or not (¼ to 2 pints for horses and cattle, according to size and age, and 1 to 8 ounces for sheep and goats). *No irritant purgatives should be administered to animals suffering from arsenical poisoning.*

6. Animals suffering from severe diarrhoea should be given the following remedies:—

(*a*) *Lime water, raw linseed oil, carron oil and tannic acid.*

Lime water is prepared by thoroughly shaking up 1 desertspoonful of slaked lime in a bottle of water, and pouring off the water when the lime has settled.

Carron oil is a mixture consisting of equal parts of raw linseed oil and lime water.

Lime water and raw linseed oil may be used separately but it is preferable to use them mixed, i.e. in the form of carron oil.

In treating cases of purging, the following remedies should be administered, not once only, but twice daily, until an improvement is noticeable.

Doses of lime water.—For cattle and horses, 1 to 8 oz. according to age and size; for sheep and goats, ½ to 3 oz.

Doses of raw linseed oil and carron oil.*—For cattle and horses, 2 oz. to 1 pint, according to age and size; for sheep and goats, ½ oz. to 4 oz.

N.B.—The efficacy of lime water, raw linseed oil and carron oil in cases of purging may be greatly increased by adding *two to three heaped tablespoonfuls of tannic acid* to every pint. It is said that some chemists maintain that tannic acid should not be added to carron oil as they are incompatible, calcium tannate being precipitated, but it is precisely for this reason that this mixture of carron oil and tannic acid is recommended.

Various plants found in South Africa contain large quantities of tannic acid and may therefore be used instead of purified tannic acid. These include the following:—

(i) *Elandsboontjie* (*Elephantorrhiza burchellii*).—(i) For every full-grown animal, in the case of cattle or horses, ½ lb. of the fresh root (or 2 to 3 oz. of the dry root) may be boiled in 2 to 3 cups of water for an quarter of an hour. (For young animals, one-eighth to a half of the above quantities should be used.) The water is then poured off

* Boiled linseed oil is poisonous and should not be used. It contains lead.

and may be given alone or, preferably, mixed with lime water, raw linseed oil or carron oil in the quantities given above.

(ii) Instead of the elandsboontjie root, the bark of thorn trees (*Acacia*), willows and wattles may be used. The quantities of bark from these trees required for every animal are about one-and-a-half times as much as the quantities of elandsboontjie root, while the bark is boiled in the same quantity of water. Very strong black tea could also be given, but it is expensive. Wattle-bark extract could also be used as it contains a high percentage of tannin. One tablespoonful of this extract should be added to each pint of carron oil.

(*b*) *Tincture of opium (laudanum)*.—In many cases of purging, tincture of opium has a beneficial effect. The dose for cattle and horses is one small teaspoonful to four tablespoonfuls, according to size and age; for sheep and goats, roughly $\frac{1}{4}$ of these doses. The treatment may be applied once or twice daily for a few days.

The tincture of opium may also be added to the lime water, raw linseed oil or carron oil, but should not be administered in the same mixture as tannic acid as the latter causes its precipitation and renders it inactive.

(*c*) *Brandy and white of egg*.—If the value of the animal justifies the expense, mixtures of brandy and the white of eggs may be used. Such mixtures have an excellent effect in cases of purging and general debility. For horses and cattle, two tablespoonfuls to 2 cups of brandy should be beaten up with the white of 2 to 12 eggs,according to size and age. Sheep and goats should receive a quarter of the above dose. The brandy should be diluted with an equal quantity of water. It is essential that this mixture be administered to the animals once or twice daily until improvement ensues.

Beer instead of brandy may be used in four times the quantities prescribed for the latter.

In cases where purging is slight or entirely absent, brandy, milk and eggs, or beer, milk and eggs may be given.

7. Provide affected animals with easily digestible feeds such as green barley, oats and lucerne.

Submitting of Specimens.

In all cases of suspected poisoning, specimens of stomach contents, liver, bone and skin (about 2 lb. of each) should be submitted in separate containers (preferably fruit jars). *N.B.—No preservatives should be added to these specimens.*

A large bone is required for a reliable analysis and the thigh bone (femur) of large animals and both thigh bones of small animals should be submitted. The bones should be cleared of all traces of meat and forwarded in a bag.

It is *very essential* that all four these specimens be submitted and that each of them be placed in a separate container. Furthermore, it is of great importance to know: (1) how long the animals survived after having taken ill, (2) the history of the disease, (3) the symptoms, and (4) the post-mortem appearances. It should also be mentioned whether the animals were dipped or not. If specimens from dead animals are not available, specimens of hair (5 oz. or more if possible), urine (1 pint) and dung (1 lb.) should be submitted from affected animals.

N.B.—In all cases blood smears should be submitted.

A fee of 2s. is charged for the analysis of specimens from any one animal.

Cowpeas as a Poultry Feed.

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THE cowpea, which is indigenous to South Africa, is generally known for its drought-resisting character. It is a plant that adapts itself readily to a large variety of soil and climatic conditions. Furthermore, it is a legume and consequently its high protein content considerably enhances its value as an animal feed.

The protein content, which is always the most expensive constituent of a ration is sometimes hard to procure. In the past this constituent of animal rations was chiefly imported, but owing to the war and its accompanying transport problems great difficulty was experienced in obtaining the required protein-containing feeds. The poultry industry's problems have been doubled since the protein-containing nutrients used for poultry feeds up till now have been mainly of animal origin and these happen to be very difficult to procure at present. More vegetable protein had to be used. Having due regard to the position occupied by cowpeas in our agricultural industry, it stands to reason that this crop could under the circumstances serve as a possible source of proteins in poultry rations.

Experiments with Cowpeas as Rations.

No data were available in regard to the nutritive value of cowpeas in poultry rations. Consequently, it was decided to carry out experiments to determine its value as a poultry feed in the following forms:—

(*a*) The green plants dried and ground as a substitute for lucerne meal.

(*b*) The plant as a green feed.

(*c*) Cowpea grain in chicken rations.

(*d*) Cowpea grain in laying rations.

(*a*) Very good results were obtained with ground cowpea-hay, and lucerne meal could be replaced by this product. As in the preparation of lucerne meal, it is essential that the green colour should be preserved in the haymaking process, and the higher the percentage of leaves, the better will be the quality of the meal obtained. The results of this feeding experiment were published in the April 1943 issue of *Farming in South Africa*.

(*b*) There are poultry farmers who, owing to climatic conditions, are not able to cultivate lucerne, but can grow cowpeas. In summer these people find it difficult to provide sufficient green feed for their poultry. It stands to reason that if cowpeas should prove to be suitable they could be used to advantage for this purpose.

Only limited quantities of green cowpea plants were available and consequently it could only be established whether fowls would eat the plant in the green stage or not. The birds were used to feeding on green lucerne which had been cut before the flowering stage and then cut with a cutting machine in lengths of from ¼ to ½ inch. The pods of the cowpea plants that were fed had just begun to form and the plants were cut with the same machine.

These cut plants were fed to two groups of White Leghorns of 50 each. To the one group 3 lb. cut lucerne were fed in V-shaped hoppers and to the other group the same amount of cut cowpea plants. After half an hour all the cowpea plants were consumed, whereas there was always some lucerne left. This feeding was repeated for ten consecutive days, with the same results. The cowpea

plant would therefore appear to be quite suitable for use as the succulent constituent of a ration.

In the past there were two factors which contributed towards the complete elimination or minimum use of vegetable proteins in poultry rations. In the first place very poor results were obtained with the feeding of vegetable proteins in poultry rations, which was due to the lack or a disproportion of minerals in them, such as calcium or phosphorus and certain vitamins (those of the B complex in particular). In the second place there were the high prices charged for the product in comparison with those charged for animal proteins.

It should be mentioned, however, that the idea was not to replace the animal proteins altogether, but rather to determine whether some of the animal proteins could be replaced by these vegetable proteins in order to alleviate the existing shortage of meat- and fish-meal.

Cowpea proteins show a lack of cystine, one of the amino-acids essential to growth. A combination of several protein-containing feeds was used so that they could supplement each other. From a practical point of view, all vegetable proteins will produce the best results when fed in combination with animal proteins. For growth a chicken requires about 0·5 per cent. methionine and 0·4 per cent. cystine in the ration. Vegetable proteins usually evince a lack of these constituents. Certain fish-meals on the contrary are very rich in these constituents.

The cowpeas used for the experiment included several varieties. Both raw and cooked peas were used in the form of meal. The cooked peas were baked in pans in an ordinary coal stove. The temperature was not controlled but the peas were stirred from time to time. As soon as the cream-coloured peas turned brown and the raw pea taste had disappeared, it served as a test to determine whether they were done.

The reason for using cooked peas as well, was that in the case of soybeans it has been proved that heating liberated amino-acids from the methionine-cystine complex and made them available to the body. In the case of soybeans heating considerably increased the nutritive value.

An analysis of cowpeas and fish- and meat-meal used in the experiment, as well as of other vegetable proteins tested by this Institution together with soybeans, is given in Table I.

TABLE I.—*Constituents of certain Protein-containing Feeds.*

	Protein.	Phosphorus.	Calcium.
	%	%	%
Cowpeas	23·50	0·46	0·10
Cowpea-hay	17·30	0·18	1·54
Kidney beans	22·90	0·47	0·15
Peanuts (under grade)	28·80	0·63	0·21
Soybeans	37·90	0·53	0·20
Concentra fish-meal	65·50	3·27	5·62
Meat-meal	65·50	1·92	4·00

12 ft., each with a cement run. These houses were not provided with artificial heating. No green feed was fed. The chicks were weighed individually bi-weekly. The rations fed are indicated in Table II.

(*c*) The experiment with chickens started on 29 September 1943 with 250 White Leghorn chicks divided into 5 groups of 50 chicks

each. From the first day up to the age of four weeks the chickens were housed in an electric battery brooder in which each group was heated separately in its own compartment. During this period 1 per cent. cod-liver oil was fed, as shown in Table II. After the fourth week the chicks were moved to chicken-houses measuring 10 ft. by

TABLE II.—*Rations fed from 1 day to the age of 10 weeks.*

Constituents.	Groups. 1.	2.	3.	4.	5.
	lb.	lb.	lb.	lb.	lb.
Yellow mealie meal..........	48	40¼	37	28	28
Oat meal....................	10	10	10	10	10
Wheaten bran................	10	10	10	10	10
Lucerne meal................	8	8	8	8	8
Concentra fish and meat-meal 100 : 100..................	17¾	15	13¼	11¾	11¾
Cowpea-meal (raw)...........	—	10	15	25	—
Cowpea-meal (cooked)........	—	—	—	—	25
Molasses....................	3	3	3	3	3
Oyster shell powder.........	1¾	1¾	1¾	1¾	1¾
Bonemeal....................	—	½	½	½	½
Salt........................	½	½	½	½	½
Cod-liver oil...............	1	1	1	1	1
Manganese sulphate ($MnSO_4$)..	½ oz.	½ oz.	½ oz.	½ oz.	½ oz.
	100	100	100	100	100

TABLE III.—*Calculated Composition of Rations.*

	Groups. 1.	2.	3.	4.	5.
	%	%	%	%	%
Crude proteins..............	19·52	19·54	19·57	19·54	19·54
Calcium.....................	1·61	1·62	1·55	1·56	1·56
Phosphorus..................	0·81	0·82	0·81	0·81	0·81
Crude fibre.................	4·79	5·11	5·26	5·58	5·58

The chicks were examined weekly for any deficiency symptoms such as paralysis of the legs (caused by a flavin deficiency), sores in the beak and under the feet (caused by a pantothenic acid deficiency), and perosis, which develops as a result of manganese and choline deficiency. In addition, regular observations were made of feather-growth, feather-eating and cannibalism.

TABLE IV.—*Average Weight and Feed Consumption per chicken at the ages of 4, 8 and 10 weeks, respectively.*

Groups.	Fourth Week. Cockerels.	Fourth Week. Pullets.	Fourth Week. Feed consumption.	Eighth Week. Cockerels.	Eighth Week. Pullets.	Eighth Week. Feed consumption.	Tenth Week. Cockerels.	Tenth Week. Pullets.	Tenth Week. Feed consumption.	Feed required to produce 1 lb. live weight at 10 weeks.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb
1.......	0·42	0·38	0·93	1·35	1·13	3·78	1·89	1·56	5·57	3·14
2.......	0·43	0·39	1·01	1·37	1·17	3·78	1·94	1·56	5·62	3·38
3.......	0·37	0·37	0·89	1·06	0·97	3·28	1·62	1·41	5·15	3·49
4.......	0·39	0·34	0·91	1·13	0·95	3·49	1·65	1·33	5·28	3·64
5.......	0·39	0·36	0·95	1·22	1·04	2·88	1·79	1·46	5·10	3·12

Table V.—*Chicks showing Signs of Nutritional Deficiencies.*

Groups.	Flavin deficiency.	Pantothenic acid deficiency.	Perosis.	Nutritional encephalomalacia.	Cannibalism.
	%	%	%	%	%
1	6	16	—	6	2
2	2	6	—	6	—
3	2	16	—	—	—
4	4	10	—	4	—
5	6	10	—	2	—

Table VI.—*Mortality up to the Age of* 10 *Weeks.*

Groups.	Percentage Mortality.			Total.
	Fourth week.	Eighth week.	Tenth week.	
	%	%	%	%
1	2	2	4	8
2	8	—	—	8
3	—	2	2	4
4	4	—	6	10
5	2	6	—	8

Results of Experiments.

The results obtained with cowpea grain were very similar to those obtained with the other vegetable proteins, viz., ordinary beans tested at this Institution. As has already been said, the main object was to determine whether cowpeas could replace part of the animal proteins. According to Table II as much as 25 per cent. cowpea-meal was included to replace part of the fish-meal and meat-meal mixture. The weights as indicated in Table IV are very satisfactory for all groups, especially Groups 1 and 2. It is clear, however, that any increase in the percentage of cowpea-meal resulted in a proportionate retardation of weight increase. The amount of feed required to produce a weight of one pound, increased from 3·14 lb. in Group 1 to 3·64 lb. in Group 4. It would thus appear to be uneconomical to include more than 10 per cent. of this food constituent in the raw form in chicken rations. Groups 4 and 5 contained the same high percentage of cowpea-meal. Heating considerably increased the nutritive value of the cowpeas used in Group 5 as compared with Group 4. Group 5 had the lowest feed consumption per unit of weight increase. It can be assumed that if cowpea grain is heated, an even higher percentage than 10 can advantageously be included in chicken rations. If the percentage of proteins contained in cowpea grain is taken into consideration (Table I), it is doubtful whether it will be economical to use more than 15 per cent.

From Table V it will be seen that cases of flavin deficiency occurred in each group. According to available data, fish-meal is a fairly good source of this vitamin. Nevertheless, even in Group 1, where a large proportion of the proteins was provided in the form of fish-meal, such cases occurred. The only explanation that can be given is that the quality of the lucerne meal was such that this constituent did not contribute its proportionate share. It is clear, however, that this deficiency cannot be exclusively attributed to the proteins that were fed.

In spite of the fact that three per cent. molasses were fed, the number of cases of dermatosis as a result of a pantothenic acid deficiency was very large in all groups. The molasses used were diluted with water in order to facilitate their mixing with the feed. The addition of water may have caused fermentation, which may have had a bad effect on the pantothenic acid content.

According to Table V no cases of perosis occurred. Only one case of toe-pecking occurred in Group 1. At the age of 6 weeks, however, feather-eating occurred in Groups 3, 4 and 5, especially in Group 5. At the age of 10 weeks, this had ceased entirely and all groups were well feathered.

As will be seen from Table VI, mortality was high, although not abnormally so. According to the symptoms a large percentage of these cases was due to nutritional encephalomalacia. This abnormality appears between the second and fourth weeks and reaches its maximum towards the third week. In most cases the fast-growing chickens were affected. The most striking symptoms are that the head is drawn backwards and that the chicken is inclined to fall backwards; the slightest disturbance causes an affected chicken to fall on its back. Furthermore, a twitching of the legs will be observed. The condition develops suddenly and the affected chicken usually dies within 24 hours. The post mortem examination reveals no abnormality of the liver, kidneys, proventriculus, intestines, etc.

If the constituents of the ration are taken into consideration, it is difficult to understand that there can be a vitamin E deficiency, and yet this phenomenon corresponds exactly with the description of nutritional encephalomalacia. The only explanation that can be given is that, since the factor preventing this disease is soluble in fat and is present in the unsaponifiable portion of certain vegetable oils, it is liable to decomposition. J. C. Hammand's explanation in *Poultry Science*, Volume 20, p. 369-371, viz., that there is a factor in cod-liver oil preventing the assimilation of vitamin E would hardly be applicable in this case. The percentage cod-liver oil fed was very low, viz., one per cent. Moreover, in other experiments the same quantities of the same oil were fed without a single case occurring. It was remarkable, however, that this deficiency did occur where molasses were fed mixed with water. The addition of water to the molasses and the subsequent fermentation are most probably responsible for the destruction of the factor concerned.

The Laying Ration.

(*d*) The experiment with cowpea-grain meal in laying rations commenced on 1 April 1943, and covered a period of 10 months. The Black Australorps used had just started laying and were individually housed in laying batteries. Five groups were made up, the first three of which comprised 40 birds each and the last two 36 each.

The birds were weighed every two months and separate records were kept for each bird. All the birds that died were examined and a record was also kept of all abnormalities. The same raw and cooked cowpeas already described were used in this case. The rations fed are shown in Table VII.

Crushed mealies were fed in the afternoon on top of the mixture in the feed hoppers. Green feed was fed once a day at noon and consisted of lucerne, wheat or oats in season. A quarter of an ounce oystershell was placed in each bird's hopper every week. The mixture was fed daily so that the birds could just empty their

hoppers for the day and consequently there was a minimum loss of food since it was not possible to scratch out any of it.

TABLE VII.—*Constituents of Rations.*

Constituents.	Groups.				
	1.	2.	3.	4.	5.
	lb.	lb.	lb.	lb.	lb.
Yellow mealie-meal..........	35	27½	21	13	13
Oatmeal....................	10	10	10	10	10
Wheaten bran...............	10	10	10	10	10
Lucerne meal...............	10	10	10	10	10
Concentra fish-meal and meat-meal 100 : 109............	20	17	14	10½	10½
Cowpea-grain meal (raw).....	—	10	20	30	—
Cowpea-grain meal (cooked)..	—	—	—	—	30
Molasses...................	3	3	3	3	3
Bonemeal...................	7	7¼	7½	7¾	7¾
Oyster-shell powder.........	3½	3¾	4	4¼	4¼
Cod-liver oil..............	1	1	1	1	1
Salt.......................	½	½	½	½	½
Manganese sulphate..........	½ oz.	½ oz.	½ oz.	½ oz.	½ oz.
Mash.......................	100	100	100	100	100
Yellow mealie grain..........	100	100	100	100	100

TABLE VIII.—*Constituents of equal Parts Mixture and Grain according to Calculations.*

Constituents.	Groups.				
	1.	2.	3.	4.	5.
	%	%	%	%	%
Crude fibre.................	3·64	3·80	3·98	4·14	4·14
Crude proteins..............	15·50	15·44	15·41	15·50	15·50
Calcium.....................	2·02	2·05	2·07	2·04	2·04
Phosphorus..................	0·90	0·90	0·90	0·90	0·90

TABLE IX.—AVERAGE BODY WEIGHT.

Month.	Average Weight of Birds.				
	1.	2.	3.	4.	5.
	lb.	lb.	lb.	lb.	lb.
April 1 (1943)...............	5·29	5·26	5·09	5·04	4·85
June 1......................	6·27	6·33	6·15	5·82	5·79
August 1....................	6·56	6·64	6·61	6·16	6·27
October 1...................	6·35	6·26	6·21	5·98	5·74
December 1..................	6·15	6·20	6·30	6·01	5·92
January 31 (1944)...........	6·03	6·30	6·27	5·87	5·84

The production results were analysed by statistical methods but the figures for April were omitted in order to elimate the effect of the change of rations. During August an outbreak of red mite occurred in Group 5 and gradually spread; for this reason the production of that month was also excluded for purposes of calculating the results.

TABLE X.—*Average Monthly Production and total Egg Production of Hens.*

Month.	Groups.					Average monthly production of all groups.
	1.	2.	3.	4.	5.	
April, 1943...	9·55	7·45	5·20	5·25	5·63	6·61
May..........	16·72	15·15	17·92	17·02	17·38	16·83
June.........	17·47	18·25	16·32	16·16	16·00	16·84
July..........	18·52	19·12	20·00	19·02	20·00	19·33
August.......	20·41	22·07	19·45	19·00	2·88	16·76
September....	21·23	23·76	17·30	18·34	12·44	18·61
October.......	19·71	20·95	16·63	16·31	16·52	18·02
November....	18·39	17·36	16·52	15·62	16·38	16·85
December.....	17·00	11·28	14·94	15·22	16·00	14·88
January......	16·91	12·76	14·06	15·91	16·00	15·12
Weight per 100 eggs in grams.	6409	6351	6439	6288	6297	—
Average Total.	175·91	168·15	157·54	157·85	140·23	—

In Table X it was considered convenient to show both the average monthly production and the total average production, since it was

TABLE XI.—*Average Feed Consumption (over ten months) of Birds still alive at end of Experiment, and Average feed Consumption per dozen eggs.*

Groups.	Mash.	Grain.	Total.	Feed consumption per dozen eggs produced.
	lb.	lb.	lb.	lb.
1.....................	55·72	26·94	82·66	5·63
2.....................	51·75	26·73	78·48	5·60
3.....................	52·81	27·09	79·90	6·04
4.....................	50·28	25·63	75·91	5·77
5.....................	41·78	27·02	68·80	5·88

TABLE XII.—*Percentage Mortality.*

Groups.	All deaths except those due to cancer.	Incidence of cancer.
	%	%
1....................................	2·50	5·00
2....................................	5·00	2·50
3....................................	12·50	2·50
4....................................	2·50	—
5....................................	—	5·00

desired to show the decrease in production in Group 5 during August. During that month, however, red mite broke out in the batteries in which the group was housed. The most suitable remedies for control were unobtainable, with the result that the pullets were much disturbed both by the insects and by handling. As could be expected, the pest gradually spread to the other groups, as will be seen from the steady decrease in egg production. As soon as the red mite was under control to some extent, the production in Group 5 rapidly increased. The lower average production in Group 5 can therefore

not be entirely attributed to the percentage cowpea-meal. According to the weight increase with chickens (Table IV), it was shown that heating definitely increased the nutritive value of cowpea-grain. A similar increase in nutritive value by heating is not reflected where baked cowpea-meal was fed for egg production, the reason undoubtedly being the above-mentioned outbreak of red mite.

According to statistical analysis there is no significant difference between Groups 1, 3 and 4, and although the difference between Groups 2 and 3 is not beyond doubt, the first three are otherwise better than Groups 2 and 5.

The amounts of feed required to produce one dozen eggs in the various groups are given in Table XI. The birds in Groups 1 and 2 yielded the most ecônomical production and in this respect show very little difference. The low total feed consumption in Group 5 can be attributed to the lower production during August and September. The feed consumption during those months decreased considerably as could normally be expected if the production decreased.

From Table IX it will be seen that the birds of Groups 4 and 5 weighed least of all the groups, although their average weight can still be considered satisfactory. The figures in this Table clearly prove that cowpea-meal does not detrimentally affect the palatability of the mixture.

Mortality figures are given in Table XII. Birds that died of some form or other of cancer are indicated separately since the mixture cannot be held responsible for their death. Except in the case of Group 3, the mortality figure was particularly low. Even in this group a few cases occurred which could hardly be attributed to the ration. As far as this is concerned, it is clear that the cowpea-grain meal did not have any detrimental effect on the pullet's health.

Conclusions.

The results obtained at this Institution in regard to the feeding of poultry on the cowpea plant and its grain, justify the following conclusions:—

1. In the green stage the cowpea plant is readily consumed by fowls and can be substituted for other green, succulent fodder.
2. Cowpea-hay meal containing a high percentage of green leaves can be substituted for lucerne meal in poultry rations.
3. The nutritive value of cowpea grain for poultry is increased by heating.
4. Cowpea-grain meal can be included both in chicken and in laying rations, provided prices are not prohibitive. Although there was no significant difference between the control and the groups fed with from 20 to 30 per cent. cowpea meal, it is doubtful from an economical point of view whether it is advisable to use more than 15 per cent.

CORRECTION.

Sheep Grazing Experiment on Natural Veld.

On page 597 of the September 1944 issue the last sentence should read:—

7. The solution to this problem in the grass veld of the low-rainfall area seems to lie in the partial or total replacement of sheep-farming *by cattle farming*, provided a sound system of grazing is followed.

Bacterial Wilt of the Egg-plant.

Dr. Vincent A. Wager, Acting Officer-in-Charge, Botanical Station, Durban.

IN many parts of South Africa the limiting factor in the production of egg-plants, or brinjals as they are commonly called, is a disease known as bacterial wilt.*

This is a common disease, and is probably familiar to all. The plants suddenly start to wilt and collapse, and death soon follows. If such a plant is pulled up, the roots are found to be normal and there is usually no discolouration of the inside of the stem. It is only when the tissues are examined microscopically that it is found that millions of bacteria have choked up the water-conducting cells and so caused the wilting of the plant.

Other Host Plants.

Potatoes and tomatoes are susceptible to bacterial wilt or, as it is sometimes called, "vrotpootjie". In fact, the disease has become so serious in many parts of South Africa that neither of these crops can now be grown there. In laboratory experiments the tree-tomato and varieties of chilli were also found to wilt after inoculation.

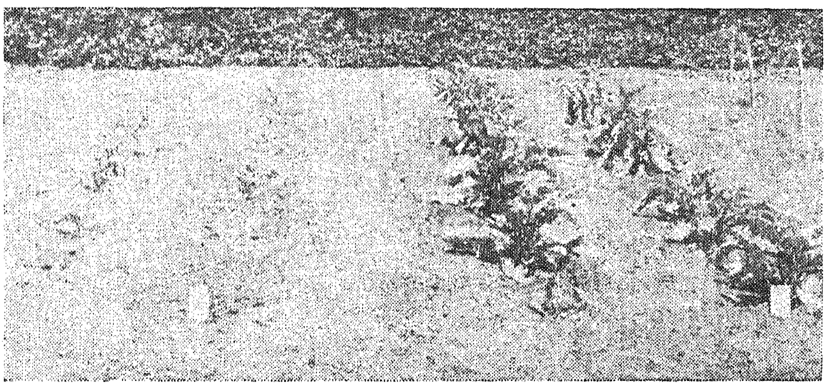

FIG. 1.—Bacterial wilt produced in tomatoes in the laboratory simply by pouring bacteria over the surface of the soil without disturbing the roots. Healthy controls on the right. [Photo: Dr. V. A. Wager.

Peanuts may become infected with this wilt, but it has been reported that the small Spanish type, or Natal common two-kernel peanut, is more resistant than the Virginia Bunch variety.

In other countries tobacco is also attacked by bacterial wilt, but it seems that this crop is immune in South Africa.

How the Disease is Spread.

Once the land has become infected with these bacteria, any healthy seedlings planted in it will be subject to attack. Any method by which infected soil can be carried from one farm or field to another will, of course, spread the disease. This could happen in irrigation water or in mud clinging to machinery or to the feet of workers or farm animals.

A common source of infection is infected tomato or brinjal seedlings, and that is why it is so necessary to use sterilized soil

* Due to *Bacterium solanacearum*.

for seed tins, or virgin land for seed beds, in order to prevent this initial infection.

A third and very common method of spreading infection is the use of infected seed potatoes. The disease can be recognized in potatoes when they are cut open, and appears in the form of a

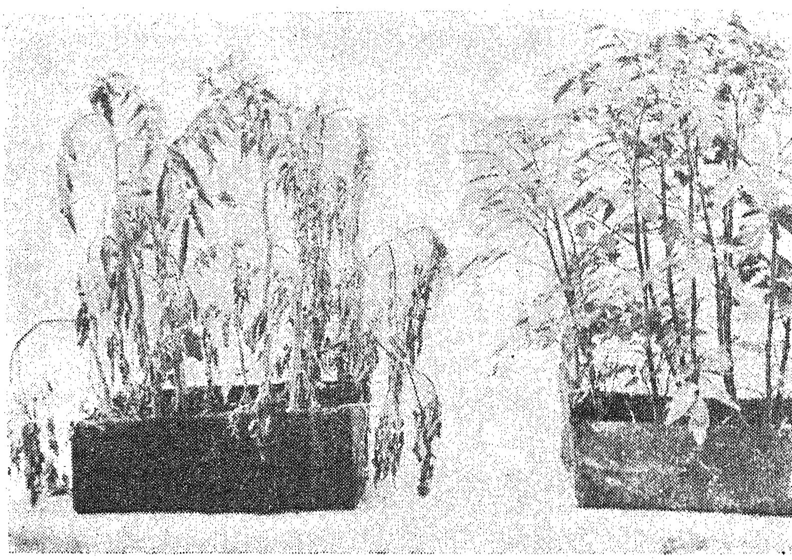

FIG. 2.—Both tins were inoculated with bacteria. The brinjals on the left are Puerto Rican Beauty and have all wilted, but none of the resistant Kopek variety on the right are affected. [*Photo: Dr. V. A. Wager.*

discoloured ring about ¼ of an inch below the skin. It is therefore important to make sure that seed potatoes come from a healthy crop, and that is best ensured by buying Government-certified seed from any one of the numerous potato seed-growing associations in South Africa.

Experiments have shown that the bacteria succumb rapidly to drying-out, so it is considered that there is little chance of their being spread by winds.

Temperature Relations.

It has been noticed that bacterial wilt occurs only during the hot summer months. Occasionally a plant may be found wilting in late autumn, winter or early spring, should the weather be warmer than usual. Then the wilting is usually a slow process and often such a plant shows a brown discolouration inside the stem if it is cut or torn open.

Laboratory experiments have confirmed this, and have shown that soil temperatures above 60° F. are necessary for the development of the disease. Thus, in most areas it is almost impossible to grow egg-plants, tomatoes, or potatoes during the hot summer months, but where no frosts are experienced in winter, good crops of these vegetables can be grown even in infected soil.

Control Measures.

Unfortunately there is at present no known means of curing an infected plant, or of preventing infection. All one can do is to take every precaution to keep the disease out of new lands.

No susceptible crop should be planted in infected land for a number of years. Seed potatoes should be healthy, and tomato or brinjal seed should be planted only in virgin soil, or soil that has been sterilized either by baking it in an oven if small quantities are required for seed tins, or by building a fire over the seedbeds.

Treating the soil with chemicals, even if effective, would be an expensive process, and not permanently effective since the bacteria could be re-introduced so easily.

Resistant Varieties.

The most effective way of attacking diseases of this nature is by the development of resistant varieties.

Large numbers of tomato varieties from all parts of the world have been tested during the past couple of years: One or two of the small wild-currant tomato have shown a degree of resistance, but not sufficient for use in breeding a commercial tomato. These tests are, however, being continued.

In other countries certain varieties of egg-plant were found to be resistant to wilt. Seeds of these varieties were obtained* and tests have been carried out during the past two years.

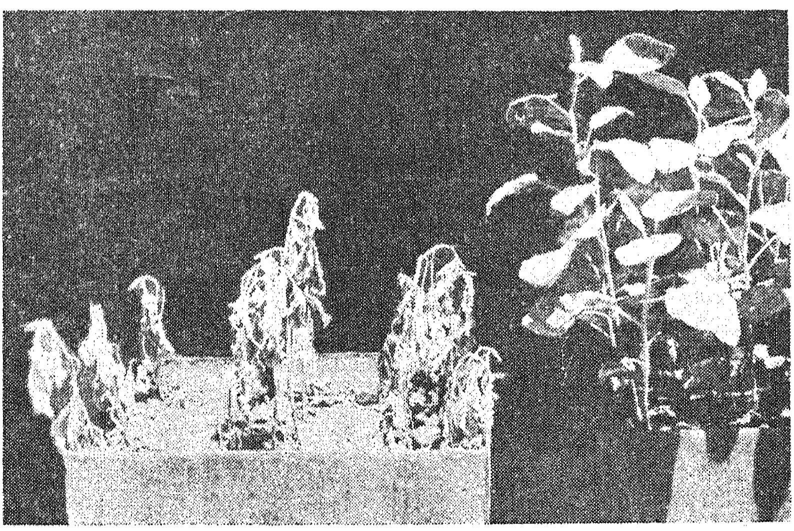

FIG. 3.—A field trial showing two lines of wilted Puerto Rican Beauty brinjals on the left and the resistant Kopek variety on the right.
[*Photo: Dr. J. Dick.*

Of these reportedly resistant varieties, two from Puerto Rico, namely, the Puerto Rican Beauty and E 12, were found to be extremely susceptible, and one from Ceylon, Matale, was moderately resistant. Of four resistant varieties from Java, two of them, Terong Kopek (long violet) and Terong Gowok (Small mauve), were highly resistant while the other two, both small-fruited varieties, Terong Glatik and Witte Ronde Terong, were very susceptible. The Terong

* Very kindly supplied by Dr. Arturo Roque, Agricultural Experiment Station, University of Puerto Rico, Dr. M. Fernando, Department of Agriculture, Peradeniya, Ceylon, and Dr. T. H. Thung, "Instituut voor Plantenziekten", Buitenzorg, Java.

Gowok developed only one or two wilted plants in all the experiments, but unfortunately it is a useless variety, having round fruits only 1½ inch in diameter.

Thus in laboratory tests under South African conditions (at Durban) two varieties, Matale and Kopek, showed a high degree of resistance. When planted out in an infected field, however ,the former showed considerable susceptibility, as the following figures will prove:—

Variety.	Original number of plants.	Number of plants alive after 9 weeks.
Puerto Rican Beauty	60	0
E. 12	60	0
Matale	50	21
Kopek	50	46

This was a severe test, for the field was severely infected and the weather unusually hot and dry. In laboratory tests, the Matale showed up to much greater advantage, but was still not as resistant as Kopek.

Future Experimental Work.

Experiments are still being conducted with these varieties and it is hoped that the resistance will be improved by selection of seed from the most resistant plants. New varieties are also being produced by making cross pollinations of these two and the very highly resistant small-fruited Gowok in the hope of developing a variety with good commercial-quality fruit together with high resistance to bacterial wilt.

Farmers wishing to try these varieties may apply to the writer for sample packets containing the susceptible Puerto Rican Beauty, and the resistant Matale and Kopek seed. Thus, the three varieties can be grown alongside one another. Growers are asked to report their results, and also to save seed from the surviving plants for their own requirements.

The three varieties have the following appearance:—

Puerto Rican Beauty: fruits egg-shaped, black to purple in colour, and up to 8 inches long by 5 inches thick.

Matale: fruits long and cylindrical, dark purple in colour and 6 inches long by 3 to 4 inches thick.

Kopek: fruits long and cylindrical, bluish-purple in colour and 6 to 10 inches long by 3 inches thick.

The Argentine Ant:—

[*Continued from page* 632.

by leaving them overnight in water and by scraping each one with a piece of wire on the following day.

The bait should be applied about the beginning of July and renewed every 14 days to 3 weeks until October. In vineyards which are heavily infested with mealy bug, each vine should be provided with a reed for the first two seasons and subsequently one reed to every third or fourth vine will suffice. In orchards every tree should be provided with one of these containers and the poison persistently renewed until the ants have disappeared.

Safeguard the Value of our Wool Clip.

Dr. L. L. Roux, Senior Professional Officer, Sheep and Wool Research Section, Grootfontein College of Agriculture, Middelburg, Cape.

THE average annual wool production of the Union of South Africa is round about 200 million pounds (grease weight), the value of the clip approximating £13 million. The sheep industry is an important source of income to many thousands of farmers and also to many hundreds of other persons concerned with the marketing and distribution of its products.

The great bulk of the Union's clip is merino wool of exceptional quality; this country's wool is known for its superior handling and softness, which add considerably to its value as a textile for the manufacture of high quality materials. During the past wool season, merino wools of good quality realized from 20 to 26 pence per pound.

Prolonged droughts affect the normal growth of wool, and diseases such as bluetongue and internal parasites cause heavy losses. These adverse factors have been known to reduce the Union's annual wool clip by many thousands of bales. A fall of 1 penny a pound in the price of wool means a drop of over £800,000 in the country's annual income from that product.

Improved methods of management guided by the results of scientific research have eliminated some of these dangers and lessened the effect of others. Good yields and the best quality will give maximum returns, to attain which, management practices best suited to the particular conditions should be employed. Farmers should examine or test their practices periodically; what was satisfactory 5 or 10 years ago may no longer prove efficient.

More recently, and especially during the war period, some other disturbing factors have been influencing the merino-breeding policy. Many contend that merinos lack hardiness, remain stunted, are vulnerable to blowfly attack, and that their wool is ruined by "steekgras". Others consider that the greatest menace of all is the competition from synthetic fibres. Most seem to agree that the easiest solution is a departure from the merino. The greatest attraction has been crossbreeding, because the crossbred is expected to withstand the adverse factors mentioned above; in addition, mutton and lamb prices have been good, while crossbred wool prices are also at a high level.

There can, of course, be no criticism of the adoption of crossbreeding. What is important, however, is that the farmer must ensure that the change will yield a greater profit and that it will permit of an easy readjustment, should the demand for sheep products revert to previous levels. The present tendency towards crossbreeding was evidenced during past war periods.

Production Ratios.

The production ratios computed from data of the ten most important wool-producing countries in the world reveal the following: During the period 1890-92, merino-wool production was twice that of cross-bred wool. Figures for the next eight years reveal a marked increase in crossbred-wool production, due largely to the development of refrigeration. From 1903 to 1910, merino-wool production gained as a result of developments in South Africa, the ratio in 1910 being 1.26 lb. merino to 1 lb. crossbred-wool. During the war period

1914-18 crossbred production was stimulated, although merino wool also showed an increase. In 1920 the ratio was 3 merino to 4 crossbred. From 1920 onwards peace-time demands were for merino wool, and this increase continued until 1928, from which year the ratio of 1.15 merino to 1·0 lb. crossbred-wool remained fairly constant until the abnormal demands of the present war. The falling off in the demand for crossbreds at the end of the First World War (1914-18) caused merino prices to rise to nearly four times the value of crossbreds. During the slump of 1921-22 crossbred prices were only $\frac{1}{5}$ of merino prices, and only $\frac{1}{3}$ of merino prices during the depression of 1932-33. From 1933-39 there was a marked decline in merino prices, which was probably accentuated by the increased demand for crossbreds for strategic reasons.

Sound Breeding Policy Essential.

A point requiring particular emphasis is that, if crossbreeding is undertaken, it must not be haphazard since aimless crossbreeding is always detrimental. *A definite breeding policy should be followed.* The procedure will depend upon the material available and the conditions of management, especially feed. Where the maximum feed can be made available, as under irrigation, large-framed, good wool-bearing, highly fertile, good milking ewes such as Romney Marsh-merino or Dorset Horn-merino crossbreds should be mated to rams such as the Southdown. This mating will produce a good quality, rapidly-growing lamb capable of reaching a marketable live weight of 60-65 lb. at the age of 90 to 110 days. Under good *veld* conditions, even with some supplementary feed such as green cereal pasturage, the same sheep material may give only 80 per cent. success. The nutritional requirements of this crossbred type of ewe are higher than those of the merino. Merino ewes are not entirely unsuitable for crossbreeding, but they must be well-grown and roomy, and be kept in good condition, otherwise they will not rear rapidly growing lambs capable of reaching 65 lb. within, say, 3½ to 4 months or even 5 months. Rams of most of the improved mutton breeds are suitable for use on merinos, the Southdown being specially recommended. Pure-bred mutton-breed rams are subject to diseases, especially of the lungs; hence grade rams, such as ¾-bred Southdown-Blackhead Persian, are advocated. All lambs should be sold when they attain a marketable weight.

If, under arid and semi-arid conditions, one or other of the hardy non-woolled breeds can be made available for lamb and mutton production, this procedure is preferable to the use of merinos because of the greater hardiness and higher fertility of the former. In this case Southdown and Dorset Horn rams are recommended. For reasons given above, grade rams are also recommended in this system of crossbreeding. Where conditions are "hard", grading up with the improved mutton breed will not prove a success because grades above the half-bred level lose hardiness. Half-bred rams may be used continuously in order to establish a type having the desirable characteristics of the half-bred, namely, hardiness, good fertility, and good milk production.

The most destructive step to take is to use rams of such breeds as the Blackhead Persian, Ronderib Afrikaner, etc., in merino flocks purely with the object of introducing vigour and hardiness. These non-woolled breeds introduce hair and coloured fibres which ruin the clip. Some farmers consider that they will obtain greater size, hardiness and vigour by the introduction of one or other of the large-

framed improved white-woolled mutton breeds. The resulting half-breds may reveal hydrid vigour, but they are crossbreds and as such produce crossbred wool. Grading up with the mutton breed reduces what stamina the half-bred might have had, and, if the veld is not capable of maintaining the merino, it will be still less able to support a large-framed grade sheep. The alternative is back-crossing the half-bred with the merino. The resulting grades are not likely to be an improvement on the original merino if the level of the environment and management have not been improved. The use in merino flocks of half-bred rams of Corriedale and Palworth origin is definitely not recommended.

Fortunately, certain merino breeders are realizing that incorrect systems of breeding and wrong methods of management have produced poor doers and uneconomic producers with low fertility. It is gratifying to see that they are now aiming at the evolution of types of merinos which are more suitable for their specific conditions and that many are beginning to realize that health and vigour are essential if high wool yields are to be attained.

Future of Wool.

At present no one can say with any great certainty what the future holds for wool. Wool is one of the most important staple commodities of international trade and much of its future undoubtedly depends upon international trade agreements and financial arrangements. The opinion has been expressed that ". . . the inclusion of wool in a large-scale international buffer pool scheme operated for a wide range of primary products might be of more than sectional interest by helping to bring about that degree of *general* world economic stability which is an essential prerequisite for post-war prosperity ". Wool is the best textile product that will be available in abundance after the cessation of hostilities. Wool will play a most important part in clothing and protecting the large masses of people who will be devoid of even the simplest necessities of life. As soon as labour and machinery can be made available, the several millions of bales of accumulated wool will be put to good use.

Competition from synthetic fibres cannot be passed over lightly. World rayon production increased from 104 million pounds in 1923 to 2,381 million pounds in 1940. Of the four most important fibres (cotton, wool, rayon and silk), rayon and wool represent 13 and 12 per cent. respectively of the world's total production. According to the opinion of some, the greatest influence of the competition of synthetic fibres will be experienced only about 5 years after the war. Experts in textile matters emphasize the need for thorough and constant research in every aspect of the production, marketing, and manufacture of wool in order to ensure the production of a product of the highest possible textile quality at a competitive price, to eliminate unnecessary expense in handling and marketing, and to discover efficient methods of manufacture of new light-weight materials of attractive design.

Maintaining the present prestige of South Africa's wool production and guarding the Union's merino wool clip against the introduction of harmful features such as hair, coloured fibres, poor quality, etc., seem to be the proper contribution of all producers towards the establishment of wool among the greatest textile fibres of the post-war era.

Powdery Mildew or Oidium-Disease of the Vine:—

[Continued from page 648.

It may be mentioned here that the three summer treatments, carried out at the times represented in Figs. 8 and 9 also gave the best results against anthracnose and various leafspot diseases in most areas, including Transvaal and the Orange River irrigation area. Furthermore it is cf importance to state that sulphur has been found to be one of the best fungicides for the control of anthracnose and of the *Isariopsis* and *Exosporium* leaf-spot diseases in vines.

The regular execution of a standard dusting programme in which sulphur is applied at periods as indicated above, with a supplementary winter-spraying in those cases where anthracnose occurs, is thus strongly to be recommeded as a general programme for the control of disease.

Time of Application.

Most writers have alleged that the best time for commencing with the sulphur dusting applications is after the dew has disappeared from the vines—more or less from nine o'clock onwards.

A series of vines was dusted with sulphur according to the standard programme at a fixed time, and eventually the health of the crop was compared, as is represented in Fig. 10. It may be mentioned here that on all dusting occasions, the vines were only slightly damp with dew at 5 o'clock. Excessive dew which could have hampered the treatments, was not present on any of these occasions.

The results as represented in Fig. 10, clearly indicate that under these circumstances, it actually makes no difference whether the vines are dusted with sulphur at 5 a.m. or at 10 a.m.

Where weather conditions are promising and the vines are only slightly damp with dew, it is therefore unnecessary to delay dusting until after breakfast—a practice which often proved disadvantageous in that dustings later in the day were hampered to such an extent by wind as to render is impossible to apply treatment at the appropriate time. In consequence preventable losses due to the spreading of *oidium* were often suffered.

Sulphur Scalds.

Sulphur scalds occur particularly in those cases where sulphur applications are followed by excessively warm days. It appears that the berry is particularly sensitive to sulphur scalds during the period of rapid swelling. This is also the period when certain berries are particularly susceptible to *oidium* infection.

Treatments must, therefore, although thorough, be given as lightly as possible. These requirements once again stress the neccessity for timely and thorough treatments at an earlier stage when the berries are less susceptible to scald and when timely steps can be taken against *oidium*.

Nursery Quarantines.

The following nursery quarantines were in force on 1 September 1944:—

Parktown North Nurseries, 167-169 Jan Smuts Avenue, Parktown North, Johannesburg, on pyracantha and mixed deciduous (part), for pernicious scale.

CORRECTION.

Grade Southdown Sires for Sucker-lamb Production.

On page 560 of the September 1944 issue the columns of figures under the headings *Grade C* and *Conformation* in Table 4 should be transposed.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Vol. 24 | OCTOBER 1944 | No. 266

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Price Review for August 1944.*

Fruit.—Moderate quantities of apples ex cold storage were supplied on the markets. In general the quality was fair but sales were unsatisfactory and prices showed little change. Valencias and seedlings were plentiful on most markets. The demand for these varieties, however, was less keen than for navels and substantial quantities were carried over daily. Naartjies and grape-fruit were heavily supplied and sold at lower prices than during the previous month. In the case of tropical fruit, fairly heavy supplies of papaws and bananas were offered and prices fell slightly, whereas avocados and pineapples were sold out at high prices as a result of smaller supplies.

Vegetables.—Most markets were well supplied with vegetables such as cabbages, cauliflower and carrots, except the Johannesburg market where supplies declined, especially towards the end of the month, and prices advanced considerably. Larger consignments of Transvaal green beans and green peas were received and prices dropped. Pumpkins, marrows, squashes, carrots and beetroot experienced a constant demand and were sold out at reasonable prices.

Tomatoes.—Heavy quantities, especially Transvaal consignments, arrived on the market. Poor and green qualities retarded sales and price fluctuations were caused.

Onions.—The supply of Cape onions was fairly plentiful. The demand was good and prices were maintained at a high level.

Potatoes.—The position on the potato market showed no improvement. The inadequate supply could not satisfy the demand. As a result of the shortage of potatoes the price of sweet potatoes, which were supplied in fairly large quantities, showed a considerable increase on all markets.

Seed and Grains.—Fairly large quantities of dry beans and peas were suplied on the Johannesburg market. Prices showed no noteworthy change in comparison with those of the previous month.

* All prices mentioned are averages.

Feeds.—Best quality Cape lucerne, teff and locally grown oats were scarce on the Johannesburg and Cape Town markets. Large quantities of inferior and ordinary qualities, however, were sold on the Johannesburg market as result of the dry weather experienced. Good quality grass and green fodder were offered on the Cape Town market with the result that the demand for lucerne decreased somewhat.

Eggs and Poultry.—The supply of eggs showed a further increase during the past month. On the Johannesburg market prices for new-laid eggs dropped from 1s. 9d. to 1s. 4d. per dozen. Supplies on the poultry market were satisfactory and prices remained firm.

Index of Prices of Field Crops and Animal Products.

As shown elsewhere in this issue, the monthly index remained unchanged at 163.

The only important changes occurred in the following groups:—

1. "Other Field Crop Products" which increased from 317 during July to 343 during August, mainly as a result of the increase in prices of potatoes and sweet potatoes.
2. "Slaughter stock" which increased from 163 during July to 170 during August, mainly as a result of the full increase in seasonal prices of cattle which came into force from 15 August 1944. (For further particulars regarding this, see article elsewhere in this issue).
3. "Poultry and Poultry products" which declined from 187 during July to 160 during August as a result of the decrease in prices of eggs.

Agricultural Conditions in the Union during August 1944,

Rainfall.—Particularly heavy rains fell in the Western Cape Province, notably in the districts Caledon and Hopefield. The rainfall was also satisfactory in the rest of the Province with the exception of the Transkei and the north-western Cape Province. In the latter regions, as well as in the rest of the Union, the precipitation was very poor, and dry cold weather prevailed, whilst frost occurred fairly generally.

Livestock.—In those parts of the Cape Province where the rainfall was satisfactory, the pasture also improved considerably, and consequently also the condition of the stock. Lamb crops in these areas also appear to be fair. In the rest of the Union, particularly in the O.F.S. and Natal, the condition of all stock was relatively poor. Very few stock diseases occurred.

Winter Cereals.—Prospects for wheat and other winter cereals in the Cape Western Province are very promising. Several districts expect record crops. In the O.F.S., however, winter cereals are making poor progress as a result of the drought, untimely frost and the appreciable damage done to the young plants by green lice. Prospects for winter cereals in the Transvaal in general seemed promising. Green lice have also appeared in parts of the highveld, but an improvement in this respect is anticipated as soon as summer rains set in. In parts of the Eastern Cape Province untimely frosts have damaged young winter cereals somewhat, but the general prospects here are also promising.

With the advent of spring, *vegetables* in general became fairly plentiful, particularly in the Tranvaal lowveld. Potatoes, however,

remain scarce. Farmers in the Rustenburg district, as well as in the tobacco-growing regions of the Cape Province, intend planting tobacco on a considerable scale. Unless fruit orchards in the Western Cape Province are damaged by untimely frosts, a good *deciduous fruit* crop can be expected. In other parts of the country frosts caused extensive damage to fruit orchards in the budding stage.

Meat Control Scheme: Increase in Prices of Cattle and Sheep, and Further Measures.

Prices of Slaughter Cattle.—In order to meet producers in view of the higher feed costs it has been decided to bring into effect, as from 15 August, 1944, the full increase in seasonal prices of cattle, viz., 5s. per 100 lb. dressed weight instead of only from 1 October, as was originally announced.

Super Mutton.—It appeared that the producer of exceptionally high quality prime sheep did not receive sufficient compensation under the existing fixed prices for mutton. It has therefore been decided to introduce a special grade of mutton above prime, viz., a super grade which will compare with the existing super lamb and super beef grades.

The price of this super grade has been fixed for the producer at 10d. per lb. dressed weight (excluding the value of the skin and offal) for the Witwatersrand, Pretoria and Cape Town; 10½d. per lb. for Durban and Pietermaritzburg; and 9⅝d. per lb. for the remaining controlled areas.

Prices of Slaughter Sheep.—It appeared that the trade could absorb a further slight increase in the prices which they have to pay to the Food Controller for sheep, provided they have a large enough turnover. It has consequently been decided to increase the prices of sheep, goats and lambs right through by ¼d. per lb. dressed weight as from 28 August, 1944. The new prices for the Witwatersrand, Pretoria and Cape Town will now be as follows per lb., warm dressed weight:—

Mutton: Super, 10d.; Prime, 9⅜d.; Grade I, 8⅜d.; Grade II, 6½d.; Lamb: Super, 12d.; Prime, 10d.; Grade 1, 9½d.

Prices for the corresponding grades in Port Elizabeth, East London, Bloemfontein and Kimberley are ⅜d. per lb less, and in Durban and Pietermaritzburg ½d. per lb. higher.

To these prices an amount for the value of the skin and offal must of course still be added, which is approximately 1¼d. per lb. dressed weight in the case of the Witwatersrand and Pretoria after allowance has been made for municipal fees and slaughtering costs.

This increase in prices to the producer will, however, not bring about any increase in consumers' prices.

Extension of controlled areas.—The existence in the meat trade of a black market which flourishes on an extensive scale outside the controlled areas, was found to hamper the successful operation of the meat scheme appreciably. In order to terminate this it has been decided to proclaim these adjoining areas also as controlled areas. This measure came into operation as from 1 September, 1944.

Maximum retail prices in rural areas:—The previously announced maximum retail prices for meat in rural areas will be decreased on an average by 1d. per lb. in the

case of beef, and 2d. per lb. in the case of mutton and lamb, as from 8 September, 1944. This decrease has been effected because in the light of experience gained since fixed maximum prices were introduced in these areas. it appeared that these prices were relatively higher compared with those in force in the controlled areas. For full particulars regarding these new prices see *Government Gazette Extraordinary* of 8 September, 1944.

Egg Marketing Scheme: 1944 Season.

THE egg-purchasing scheme introduced by the Government during 1942 and 1943 resulted in greater stability in prices to both producers and consumers, and the community benefited to such an extent that the shortage of eggs during the short season of 1943 was not repeated during the past short season (i.e. of 1944).

With this stability and the general improved feed position in the Union, it was anticipated that production would increase still further during the present season, and the Government accordingly again decided to introduce a scheme similar to that which operated during the 1943 season.

Under this scheme the Food Controller exercises full control over all cold-storage eggs in order to ensure that the greatest possible qauntity of eggs are stored, and also to ensure the even distribution of cold-storage eggs during the coming short season.

The Food Controller is again the sole purchaser of surplus eggs during the present plentiful season. The purchasing scheme will be on the same basis as during 1943. (See August 1943 issue of *Crops and Markets* for particulars regarding the 1943 egg-purchasing scheme).

In order, however, to have better control over the quality of eggs for storage purposes, the Food Controller reserves the right to purchase only certain grades of eggs. He may further refuse to purchase eggs from firms other than those approved and registered with the Food Control Organisation and may refuse to purchase from any registered firm which, in his opinion, does not comply with the regulations.

During the 1943 season the following prices were paid for eggs under the scheme:—

Special Grade, Large and Medium, 1s. 11d. and 1s. 9d. per dozen, respectively. Grade I, Large and Medium, 1s. 8d. and 1s. 6d. per dozen, respectivly.

Under the simplified grading regulations introduced during December 1943, the two grades Large Special and Large Grade I were merged and these simplified grading regulations will, in so far as the grading effects the public, be continued during the present season.

For the 1944 season the following prices are paid under the Scheme:—

		Per dozen. s.	d.
Grade I	Extra Large	1	9
	Large	1	7
	Medium	1	5
	Small	1	3
Grade II	Large	1	5
	Medium	1	3
	Small	1	1

Maximum Prices of Poultry Food.

MAXIMUM prices for all kinds of poultry food have been fixed by the Price Controller at prices ordinarily charged by sellers during June 1944.

See *Government Gazette Extraordinary* of 8 August 1944.

Maximum Prices of Milk.

MAXIMUM prices for milk have been fixed by the Price Controller at the levels ruling during the week ended 8 July 1944.

The measure does not apply to sales of milk to condenseries, cheese factories, creameries or to milk sold for manufacturing.

See *Government Gazette Extraordinary* of 8 August 1944.

Review of the 1942-43 Cotton Crop.

GOOD spring rains enabled early ploughing and planting to be done and this was more or less completed by the end of November. Moisture conditions remained good until January, but temperatures were relatively low during December, as this tended to retard growth. A dry period in February followed by excessive rains in March and April caused rapid shedding and pest trouble.

As per ginners' returns the total crop for 1942-43 amounted to 233,439 lb. lint or 472 running bales. Compared with those previous seasons, the details are as follows:—

	1942–43.	1941–42.	1940–41.	1939–40.	1938–39.
Running bales	472	710	1,612	1,676	604
Statistical bales (500 lb.)	467	683	1,486	1,649	598
Lint (lb.)	233,439	341,413	742,902	824,514	298,853
Seed cotton (lb.)	699,334	1,067,105	2,125,199	2,529,819	894,691
Seed [delinted and undelinted (lb.)]	425,295	672,348	1,307,052	1,601,898	550,334
Linters (lb.)	31,948	62,631	78,501	75,597	21,599

Production by areas, with the last two seasons' figures for comparison, is as follows:—

	Seed Cotton (lb.).		
	1942–43.	1941–42.	1940–41.
Natal and Zululand	93,106	132,658	497,379
Rustenburg area (including Pretoria and Marico)	19,641	18,392	194,180
Northern Transvaal (including Waterberg, Pietersburg and Zoutpansberg	1,868	15,262	182,650
Eastern Transvaal (including Middelburg, Lydenburg and Barberton)	496,427	790,118	1,046,825
Southern Transvaal (Pongola River area)	—	—	1,451
Cape Province	29,727	46,192	63,684
Swaziland	58,565	64,483	139,030

GRADING.

Comparison of Staple.	1942–43.		1941–42.		1940–41.		1939–40.	
	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent.
$1\frac{1}{4}$ inch and above	23	4·87	18	2·54	—	—	153	9·13
$1\frac{3}{16}$ inch	—	—	11	1·55	61	3·78	53	3·16
Full $1\frac{1}{8}$ inch	13	2·75	—	—	—	—	—	—
Good $1\frac{1}{8}$ inch	337	71·40	391	55·07	1,017	63·09	1,067	63·66
$1\frac{1}{8}$ inch	99	20·98	290	40·84	485	30·09	390	23·27
$1\frac{1}{16}$ inch and below	—	—	—	—	49	3·04	13	0·78
TOTAL	472	100	710	100	1,612	100	1,676	100

Comparison of Grades of Good Colour Cotton.	1942–43.		1941–42.		1940–41.		1939–40.	
	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent.
Middling Fair	—	—	—	—	—	—	—	—
Strict Good Middling	42	8·90	36	5·07	117	7·26	199	11·87
Good Middling	80	16·95	195	27·46	281	17·43	193	11·52
Strict Middling	119	25·21	192	27·04	281	17·43	436	26·01
Middling	36	7·63	66	9·30	141	8·75	301	17·96
Strict Low Middling	—	—	—	—	213	13·21	212	12·65
Good Colour	277	58·69	489	68·87	1,033	64·08	1,341	80·01
Fair colour	—	—	—	—	8	0·50	105	6·27
Very light spotted	106	22·46	186	26·20	434	26·92	182	10·86
Other off-colour	89	18·85	35	4·93	137	8·50	48	2·86
Total	572	100	710	100	1,612	100	1,676	100

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

Season (1st July to 30th June).	Summer Cereals. (a)	Winter Cereals. (b)	Hay. (c)	Other Field Crops (d)	Pastoral Products. (e)	Dairy Products. (f)	Slaughter Stock. (g)	Poultry and Poultry Products. (h)	Combined Index
Weights.	19	13	2	3	34	6	17	6	100
1938 39	92	107	96	89	79	102	106	92	98
1939–40	86	107	77	95	115	105	106	89	103
1940–41	109	113	106	156	102	108	110	104	108
1941–42	121	134	143	203	102	131	134	145	123
1942–43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	216	158
February	168	183	134	188	122	144	176	235	158
March	167	183	124	179	122	144	174	240	157
April	167	183	132	262	122	144	170	279	162
May	183	183	158	289	122	169	166	273	167
June	182	183	170	315	122	169	161	257	166
July	182	183	147	317	122	195	163	187	163
August	182	183	147	343	122	195	170	160	163

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet-potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

SEASON (1st July to 30th June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade I.		Natal.	O.F.S.	Transvaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939-40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940-41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941-42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942-43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 4	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	16 6	14 10	11 6
April	23 1	21 11	30 2	30 4	29 9	25 11	25 4	30 2	24 0
May	27 10	26 7	30 7	29 6	29 4	28 10	29 2	28 10	26 3
June	29 8	27 8	—	—	30 0	29 11	29 7	29 8	28 4
July	30 0	—	—	—	29 6	29 11	28 3	30 0	30 0
August	33 1	—	—	—	30 0	32 7	35 3	30 9	32 3

Average Prices of Eggs and Poultry on Municipal Markets.

SEASON (1st July to 30th June).	EGGS.			FOWLS (Live, each).			TURKEYS (Live, each).		
	Johannesburg, New-laid. Per Dozen.	Durban, New-laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939-40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940-41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941-42	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942-43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February	2 8	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 3
1944—									
January	2 4	2 4	17 3	4 10	4 10	5 0	16 10	19 4	13 11
February	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March	2 10	2 9	19 10	4 1	4 11	4 7	13 5	18 3	13 4
April	3 2	3 5	24 5	4 2	5 3	4 1	15 0	17 0	13 8
May	3 2	3 6	24 9	5 0	5 5	4 2	13 8	15 8	13 11
June	3 0	3 3	20 7	5 7	5 7	5 1	14 10	16 9	13 9
July	1 9	2 1	16 8	5 11	5 9	6 4	16 2	15 11	16 4
August	1 4	1 4	12 10	6 1	5 9	6 9	19 3	20 1	19 1

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.). Johannesburg (a). Cape.	Transvaal.	Cape Town 1st grade.	Teff Johannesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.). F.o.r. Producers' Stations. K1.	K2.	DRY BEANS (200 lb.). bags. Johannesburg (a). Speckled Sugar.	Cow-peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January	5 0	—	7 0	5 10	20 3	20 5	62 4	26 0	35 2
February	5 2	3 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March	4 11	3 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6
April	5 3	4 6	7 2	3 9	17 9	17 7	71 6	38 9	44 0
May	6 4	3 9	7 3	4 4	18 0	18 6	71 8	37 11	54 5
June	6 9	5 6	7 5	4 11	16 10	16 10	96 1	42 0	78 10
July	5 9	4 11	7 6	4 7	16 2	16 2	92 3	42 0	64 8
August	5 10	4 10	7 7	4 3	15 2	15 2	88 10	38 5	75 3

(a) Municipal Market.
(b) Seasonal year for Kaffircorn, 1 June–31 May Dry Beans, 1 April–31 March; Lucerne and Teff 1 July–30 June.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

SEASON (1st July to 30th June).	GREEN BEANS (Pocket 20 lb.). Johannesburg.	Cape Town.	Durban.	GREEN PEAS (Pockets 20 lb.). Johannesburg.	Cape Town.	Durban.	CARROTS (Bag). (a). Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942-43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	18 2
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	19 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 11	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11
December	2 1	0 6	2 5	3 8	1 5	5 10	8 6	7 0	7 7
1944—									
January	1 9	1 2	3 5	4 7	1 6	6 7	7 4	3 5	7 10
February	4 4	2 1	4 0	7 2	—	5 9	9 0	6 0	15 1
March	2 8	3 8	2 0	6 9	5 0	6 6	13 6	8 11	24 5
April	1 10	1 11	1 4	3 7	2 3	4 6	10 3	12 5	35 1
May	3 5	2 10	2 9	7 4	5 3	4 10	9 10	12 7	27 0
June	6 6	9 1	5 4	7 9	6 4	6 5	11 10	13 6	20 6
July	4 9	8 4	5 3	4 1	4 7	5 7	9 11	13 11	19 0
August	5 0	4 9	6 7	2 8	2 6	3 6	6 10	11 6	14 1

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg; 130 lb. Cape Town; 90 lb.; and Durban; 120 lb.

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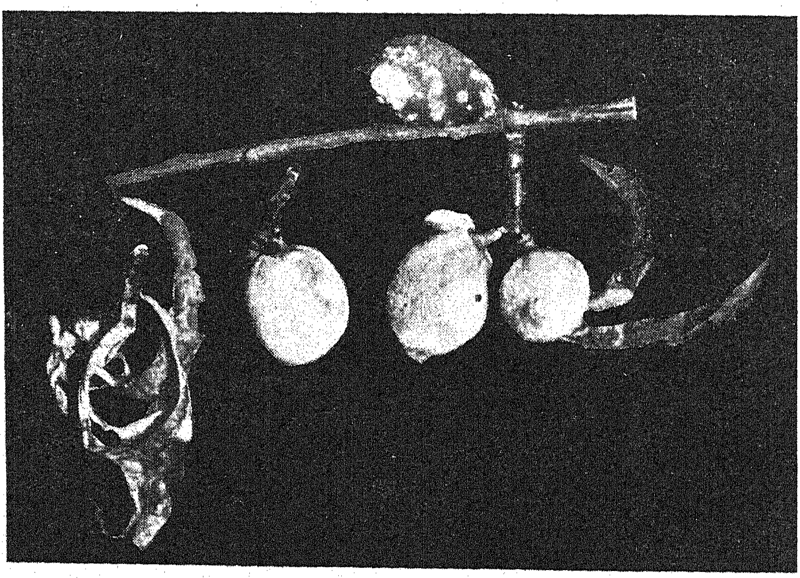
[*Photo on Cover by S.A.R. & H.*]

Peach Mildew.

Miss A. M. Bottomley, Division of Botany and Plant Pathology.

IN the June 1943 issue of this journal, A. J. Louw of the Fruit Research Station at Stellenbosch drew attention to the seriousness of peach mildew in parts of the western Cape Province, but, since the disease had at that time not been encountered in orchards outside that area, the note appears to have escaped the notice of growers elsewhere. It is with a view to putting the latter on their guard against the disease that the matter is again brought forward.



Peaches and nectarine (upper) and peach leaves infected with powdery mildew.
[*Photo: L. Kresfelder.*

Peach mildew, caused by the fungus *Sphaerotheca pannosa* var. *persicae*, is considered in some countries to be one of the most destructive and economically important of peach diseases since it not only spoils the fruit but may cause premature defoliation, stunting and a general weakening of the tree. It is world-wide in its range but varies in intensity and destructiveness in different countries. The disease has been known in the Union for a number of years as a minor nursery trouble, but it is only fairly recently that it has assumed a rôle of importance in the orchard. Starting in the western Cape Province where it is said to attack apricots, nectarines and peaches, it has now made its appearance in peach and nectarine orchards in the Transvaal.

Symptoms.

The disease is easily recognised on the fruit, leaves and young shoots by the presence of white to brownish powdery spots which gradually increase in size and number until large areas are covered. When leaves are attacked these become puckered and distorted; the edges curl or fold inwards towards the midrib and the affected parts finally become brown, hard and brittle, giving the edges of the leaves

 [*Continued on page 698.*

FARMING IN SOUTH ... AFRICA

Vol. 19 NOVEMBER 1944 No. 224

Editorial:

Our Arable Land.

It has been stated in various ways that the civilization of a country depends on the top nine inches of its soil.

Dr. Hugh Bennett said recently that most of the good soil of many countries is already in use and that in future many countries which have hitherto been willing to export foodstuffs will become increasingly loth to continue to do so. If these views are correct then many nations will have to pay more attention to producing their own basic food requirements and to ensuring that such production will be maintained in perpetuity.

In South Africa the total area of farm land is about 100 million morgen of which roughly 94 million morgen are veld. About six million morgen are husbanded for the production of arable crops, mainly the grain and food crops, vegetables and fruit.

Although the veld and the arable lands perform different functions in the farming system, they are nevertheless complementary to each other. The veld provides, for the pastoral industry, the raw materials to be converted into food products and other commodities of commerce such as wool and hides, whereas the arable land contributes, in a more direct manner, to the food supply of both humans and animals.

On the one hand foodstuffs of animal origin are being produced mainly from 94 per cent. of the farm-land areas, while on the other hand those foodstuffs which are consumed without undergoing conversion are produced on only six per cent. of the total area.

The net annual contribution of the veld—via animal production—to the national income is about £30 million. Approximately the same amount, in money, is contributed by the products of arable farming.

In terms of actual food produced, the vast area of natural vegetation was, according to pre-war estimates, not providing enough foods of animal origin for the optimal nutritional requirements of the population. In spite of this there is abundant evidence of veld deterioration in many parts of the Union. It is perhaps fortunate that much of the grazing area has not been forced to greater limits in attempts to support an even larger livestock population than that which it is carrying at present. Only with better and more efficient methods of veld utilization and supplementary feeding could the volume of animal food products be materially increased without further prejudice to the natural plant cover. This is a problem requiring immediate attention.

The arable soil—that part of the farm which is ploughed and cultivated and used for growing crops—has been husbanded in the past in a manner which leaves much to be desired and which is also giving cause for grave concern to-day. The average crop yields per

morgen are exceptionally low, being only about 6 bags in the case of maize, the staple food crop of the bulk of the population. A great deal of the surface soil has already deteriorated or has been lost in the process of producing crops.

For these and many other reasons arable farming has been looked upon with disfavour by those who consider that South Africa is primarily a pastoral country. But the situation must be viewed in balanced perspective. To produce adequate foodstuffs the efficiency both of pastoral and arable farming will have to be improved.

It should be borne in mind that the contribution in human food, whether in calories or in money, of the 6 per cent. of farm land under the plough, together with the quota of supplementary feeds which it contributes to the feeding of livestock, is greater than the contribution of the remaining 94 per cent. Furthermore, by paying attention to some of the simple principles of good field husbandry, the plane of production—even without an increase in area— can be materially raised.

Our immediate problem is to produce more food, not less; but it will require the greatest care to sustain production without further land wastage.

The improved methods of husbandry which have been referred to are not complicated but they do require intelligent application on the part of the farmer, as well as increased effort. They also require adequate technical guidance on the part of the State.

Space will not permit of a detailed discussion of all the fundamentals involved in the improved use of arable land, but there are two factors which remain paramount. Firstly, *the retention of the top-soil on the farm* must be ensured, and secondly, *better farming methods* will have to be applied. These essentials are summed up in what is becoming a popular catch-phrase, conservation farming.

The simple principles required to attain the first of these requirements—the retention of the top soil—are to avoid ploughing steep slopes, to plough along the contours, to erect contour banks or to practise strip-cropping, to avoid abandoning ploughable land without ensuring that it will be adequately protected by some form of vegetation.

In conjunction with the above are needed more attention to better farming methods—the use of better agricultural seed of improved and adapted varieties, the use of adequate fertilizers in an intelligent manner, the control of weeds which compete for moisture and nutrients and lower the value of crop-products, the rotation of crops, the keeping of better animals, and the conservation of waste products of the farm.

And if what Dr. Bennett says in general, applies to South Africa in particular, there is not much prospect of adding materially to the area of the best of the existing arable land. It behoves us, therefore, to pay attention to the better use of what we already have, and to conserve this limited area of ploughable land if we are to have more people and better-fed people in the years to come.

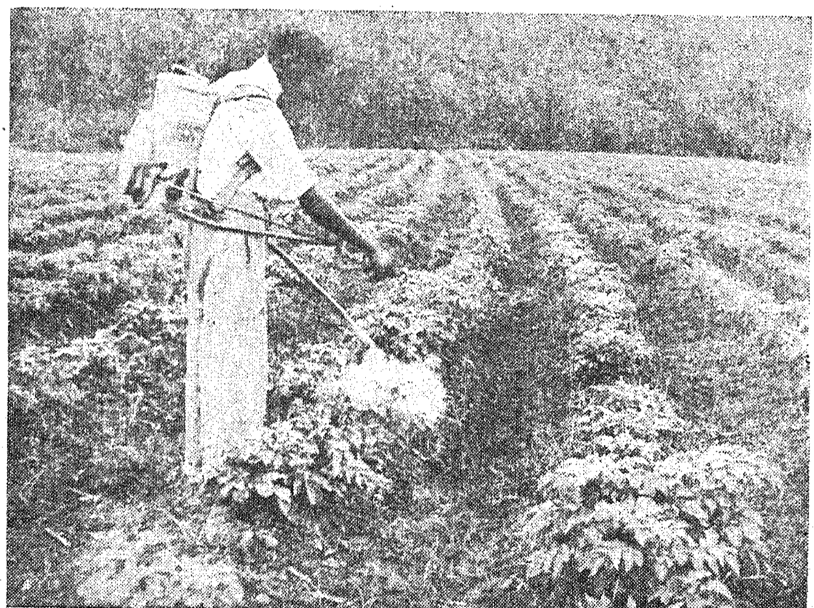
The intelligent use of arable land—the top nine inches of soil in which the food crops are grown—is the real basis upon which our future depends.

(D. G. Haylett, Professor in Agronomy, Agricultural Research Institute, Pretoria.)

Dusting Potatoes for Late Blight.

Dr. Vincent A. Wager, Acting Officer-in-Charge,
Botanical Station, Durban.

THE years 1942, 1943, and the early part of 1944 were especially wet in many parts of South Africa. During this period the leaf disease of potatoes known as *late blight** appeared to build up in intensity until nearly every patch of potatoes was infected, and, moreover, the disease occurred in many parts of the country where it had never been seen before. Early in 1944 the disease swept through huge areas of the Orange Free State where the greater part of South Africa's table potatoes are produced, and practically wiped out the crops. This resulted in what has probably been the worst "potato famine" that South Africa has experienced.



Dusting potatoes with a bellows duster.

Late blight has of course been known for many years in this country, but attacks have been confined mainly to certain areas such as George and Knysna in the Cape, the midlands of Natal, and the mist-mountains at Haenertzberg in the Transvaal. Elsewhere, infection has been sporadic.

Symptoms.

Late blight can be recognised by the large brown or black blotches which appear on the leaves, usually starting at the tip or side. These blotches spread so rapidly that soon the whole leaflet is killed and the blight spreads to the neighbouring one. The stems of the plants are also attacked and in some cases are infected first, an inch or so turning black, so that the upper part of the plant may collapse as a result. On the underside of the blighted leaves a white mould is visible. This is made up of countless microscopic

* Due to the fungus *Phytophthora infestans*.

spores, which when splashed or blown on to leaves wet with rain or dew, will produce new spots in about four days' time.

Rapidity of Spread.

The disease usually appears as an isolated patch, or here and there throughout the field. Should a violent wind and rain storm now sweep across the country, millions of fungus spores will be spread far and wide. If continuous or intermittent rain or misty weather follows, blight will appear some four days later on almost every plant and leaf. How often has a farmer surveyed a brown and withered crop which but a short week before had been a promising stand of potatoes!

The spores die rapidly on exposure, but they could undoubtedly be carried safely for many miles by winds accompanying violent rain storms. In many instances this can be the only explanation as to how isolated crops became infected, where they were grown in virgin soil from seed known to have come from a healthy source. Furthermore, during protracted spells of wet weather, every crop in a district has been found to be infected, no matter how isolated the fields, or where the seed came from.

In many cases examined, the evidence has been clear that a new field became infected from spores brought in by a prevailing wind from an older and badly infected crop growing near by. It has been stated that the fungus cannot live in the soil from one year to another, but there are considerable difficulties in proving this in the field.

In the meantime we have no evidence to show that the disease occurs in virgin soil nor that there is any danger of potatoes contracting it when planted in old potato lands.

Early Blight.

There is another common leaf disease of potatoes called *early blight**. This can easily be distinguished from late blight as the spots are from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in size and are made up of concentric markings. More and more spots occur until they meet and the leaf curls up and dies. This disease can also be very destructive, but it is not dependent on rains for its spread. It is especially severe in areas where there are heavy dews. Early blight can be controlled by dusting as advised for late blight.

Tuber Infection.

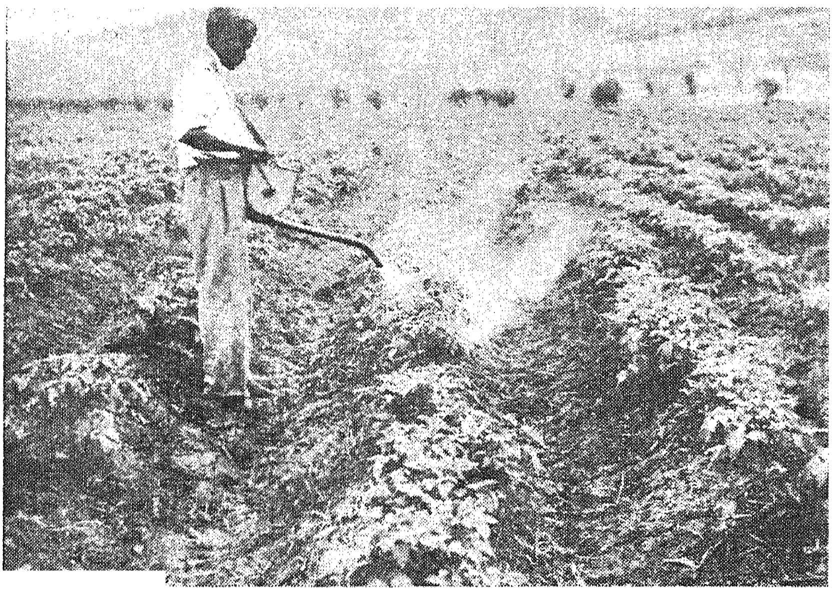
Tubers may also become infected with late blight. In the early stages the disease shows as brown areas on the skin, and, if the tuber is cut across, there is a firm brown discoloration, but with no distinct margin spreading into the interior of the potato. When the tuber is harvested, these areas become dry and sunken and are of a corky consistency. If the potatoes are left in the ground during wet weather, a rot may set in, so that the tubers become with a
rotten and have a vile odour. Growers

It is thought that in most cases the blight drops off the foliage on to the soil, and thence reaches the tubers. The practice has thus arisen in some countries of destroying the tops by spraying them with sulphuric acid, or by cutting them off, before they have had time to cause severe infection of the soil. So far, this method has not been adopted in South Africa.

* Due to the fungus *Alternaria solani*.

Danger of Infected Seed.

Infected seed-potatoes must be considered as the major source of new outbreaks of the disease. It has been shown (1) that infected seed-pieces can produce diseased plants 3 to 4 weeks after planting. However, it has also been pointed out (2) that large numbers of attempts have been made to create epidemics by planting infected seed-pieces, but only in very few instances have infected plants resulted; out of 1,400 trials during 6 years only 4 plants showed infection. In Durban many badly infected tubers were planted and the resulting plants kept under a continuous water spray, but no blight developed.



A rotary duster in operation in a potato field.

Nevertheless, it must be considered that infected seed is a serious source of danger, for, no matter how few develop into blighted plants, these few can spread the disease far and wide.

Many cases were investigated during the recent epidemic, some of these being instances where an isolated potato field was the only one in the area, and it was concluded that the only possible way in which the disease could have been introduced, was on the seed, which was known to have come from a badly infected seed-potato district.

Thus it is of the utmost importance that farmers should neither buy seed-potatoes showing any sign whatever of blight infections.

Weather Conditions.

The late blight fungus must have cool weather for its development, and will not grow at temperatures above 60° F. Thus in spells of cold wet misty weather, farmers must expect an outbreak of blight and must be prepared for it.

The disease has been observed to attack both young and old plants, but most often blight appears just as the potatoes are coming

into flower. Many cases were seen of fields in full flower and badly infected with blight, while an adjacent field of slightly younger plants, with flower heads just forming, were quite free of blight. The disease then appeared and swept through it a week or so later when the plants were in full blossom.

Prevention.

The recognised method of preventing late blight is the use of copper-lime or Bordeaux mixture, applied either as a spray or as a powder. It is important to remember that this is not a cure but a preventive. As long as the leaves are kept covered with the fungicide, spores which fall on them will be killed and will not form new spots. Thus the essence of control is to keep the leaves thoroughly covered with fungicide *all the time*, and this may necessitate 3 or 4 treatments in the course of a week should rain storms be frequent.

Dusting.

During the past three years no dusting machines have been available for sale in South Africa owing to the war. The Controller of Agricultural Machinery now advises that these machines are being manufactured in this country and will shortly be on the market. The makers of copper-lime dust also state that they have supplies on hand and that it is obtainable without a permit.

Spraying may give better protection against blight than dusting, but the latter is a much easier and quicker process. The dusting machine is carried in front, or on one's back, and operates with bellows, or by turning the handle.

The machine is worked almost as quickly as the operator can walk, but time may be wasted in making adjustments, or clearing a blocked nozzle. In one instance it took three quarters of an hour to dust half an acre, but when the operator had got used to the machine and its adjustments, it was found that an acre could be dusted in 40 minutes.

Dusting should preferably be carried out while the plants are wet with dew, but as the potato leaves are rough and hairy, the dust sticks well even when they are dry. A major consideration is, of course, the wind, for dusting can only be carried on while it is calm. It might thus be possible to dust only for a couple of hours in the early morning or late in the evening.

Number of acres per machine.—It is most important that the crop be dusted immediately after a rain, so that, taking the wind into consideration, it may be possible to use the machine for only 3 or 4 hours. This would mean that one machine would be capable of dusting, at the most, about 5 acres. The number of machines which a farmer will require, would therefore depend on the size of his lands.

Of course, there are power-dusters which connect up with a tractor and which can dust a dozen or more rows at a time. Growers of large acreages should consider acquiring such outfits.

Amount of dust per acre.—With the hand-worked machine, the dust is applied so that when the operation is over, the dust can be faintly seen on the foliage. It is not necessary that the leaves should be plastered blue with it.

It has been found that when the plants are small, about 10 pounds of dust is required for one application per acre. When the plants are larger, the amount increases to about 15 pounds. For

one acre of potatoes from 50 to 80 pounds of dust is thus used, depending on the number of applications.

Cost of dusting.—The dusting machines now available will cost somewhere in the neighbourhood of £9 each. In large quantities, the dust costs about 7d. per pound. Thus the cost of dusting an acre would be about £2 for dust plus the labour.

Number of applications.—Experience during the past few seasons has shown that once the disease has a good hold on the crop, dusting does not check it to any great extent.

If the farmer examines his potatoes carefully every few days, he should commence dusting as soon as the first spot is seen. If an infected crop is in the vicinity, then a new crop should be dusted before any spots appear on it. The potatoes should be dusted the day following a rain, or, if a spell of wet weather sets in, during a lull. This may mean dusting 3 or 4 times in the course of a week. The fact that blight can wipe the crop out within 4 or 5 days, makes this imperative. In dry weather the potatoes should be dusted at weekly, or 10-day intervals. Should blight become severe as a result of late dusting, or in spite of dusting, then there will not be much benefit in continuing dusting thereafter.

During a bad blight year the disease may spread with great rapidity, even in dry weather, if there are heavy dews nightly. As very little extra foliage is produced after the flowers are finished, many dustings during the flowering period would do more good than if they spread over the life of the plant.

Dust should be kept dry.—If the dust is moist, it will not flow easily through the machine and will tend to clog it. It is therefore important that it should be stored in the driest and warmest part of the house, preferably the kitchen.

Benefits from Dusting.

Until the writer commenced experiments in 1942, no information was available in South Africa on the benefits of dusting. A preliminary report ([3]) was published in 1942, and since then these experiments have been continued in the midlands of Natal.

The results can be briefly summarized as follows:—

District.	Date.	Yield in Bags* per Acre.		Increase due to Dusting.
		Dusted.	Not Dusted.	
Underberg..................	1942	74	69	5 bags per acre.
Donnybrook..................	1942	65	53½	11½ bags per acre.
Rosetta..................	1943	104	66	38 bags per acre.
Mooi River..................	1943	33	20	13 bags per acre.
Mooi River..................	1943	18	14½	3½ bags per acre.
Mooi River..................	1944	118	77½	40½ bags per acre.
Mooi River..................	1944	97	73½	23½ bags per acre.
Mooi River..................	1944	131	79	52 bags per acre.
Mooi River..................	1944	142	81½	60½ bags per acre.

N.B.—A bag weighs 150 pounds.

In these experiments the dusted sections remained green long after the undusted sections were brown and dead, and so stood out conspicuously in the field, much to the interest of all passing farmers.

The yields, and the increase due to dusting, vary considerably owing to the difference in fertility of the soil, the amount of blight

present, weather conditions such as rain and hail storms (which damaged some of the crops), and lastly, the methods and times of application of the dust.

In all, however, the yield was increased by dusting, in some cases amounting to 40 or 60 bags extra per acre. While the price of potatoes remains high, this represents a considerable financial gain for an expenditure of £2 to £3 per acre for dusting.

Increased Size of Potatoes Due to Dusting.

The action of dusting is to prolong the life of the leaves of the plant and this automatically results in an increase in the size of the tubers. The longer the tops can be kept green, the greater is the yield.

Some farmers have complained that they want small potatoes for seed and that dusting therefore defeats this purpose. In some of the experiments mentioned above, this point was investigated by sorting the potatoes into sizes with the following results:—

	YIELD IN lb.				
	Very large (over 5 ozs.)	*Large* (3–5 ozs.)	*Medium* (1½–3 ozs.)	*Small* (under 1½ ozs.)	*Wasty* (marbles, rotten tubers, fork-marked, etc.)
Dusted Section....	1,098	1,768	728	407	305
Non-dusted Section	364	1,162	775	439	277

In a second experiment the results were:—

	YIELD IN lb.	
	Large tubers (above 3 ozs.)	*Small tubers* (under 3 ozs.)
Dusted Section..................................	651	236
Non-dusted Section..............................	250	258

These results show that both the dusted and non-dusted sections yielded approximately the same amount of small, seed-size tubers, but that the increased yield was due to the large, or table-size tubers.

Resistant Varieties.

Certain potato varieties are more resistant to blight than others. One of these, *Sebago*, which is popular in the U.S.A., was tested here, and it was found that, although it showed considerable resistance when compared with *Up-to-date*, it produced far fewer tubers which also weighed less than those of the latter.

In the George and Knysna districts of the Cape the variety *Arran Chief* shows considerable resistance and produces a good crop, while the *Up-to-date* plants blight off. This variety is thus popular and is grown on a large scale.

Farmers in the midlands of Natal are finding that the varieties *Glen Shee* and *Flourball* are very resistant and do well. Cases have been seen where *Flourball* was planted next to *Up-to-date,* and the former was still green and flowering when the latter was blighted and dead. Farmers in that area have reported that *Flourball* gave very much better yields than *Up-to-date* in seasons of blight, and some of them have decided to plant *Flourball* exclusively, and thus do away with the bother of dusting.

General Recommendations.

Don't plant blight-infected seed.

Don't walk through potato lands to inspect the plants while they are wet with dew or rain. You will spread spores from plant to plant.

For the same reason, don't ridge, cultivate, hoe, or weed the field while the plants are wet.

Keep the dust dry.

Start dusting as soon as the first spot of blight is seen. If neighbouring crops are infected, then dust a new crop before the blight appears, starting just before the plants commence producing flower buds.

Dust the day after a rain, or in between showers during a wet spell.

Lift the potatoes of a blighted crop as soon as possible. Tuber rot will cause serious losses in wet soil.

Don't leave blighted tubers lying around in a heap. Destroy them, otherwise they may be a source of infection for the next crop.

Keep a watch for volunteers in old potato lands and remove them. They may contract blight and thus spread the disease to the main crop.

Acknowledgement.

The writer wishes to thank the following farmers for their very kind co-operation in carrying out experiments: Messrs. R. I. P. Vaughan, Underberg; N. Harris, Donnybrook; C. Ratsey, Rosetta; and T. L. Tatham, J. T. Pickering, and I. L. Gibson of Mooi River.

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(2) Bonde, R., and E. S. Schultz.—Potato Cull Piles as a Source of Late Blight Infection. *American Potato Journal*, 20, 112-118, 1943.

(3) Wager, V. A.—Controlling Late Blight in Potatoes. *Farming in South Africa*, 793-795, December, 1942.

Nursery Quarantines.

The following quarantines were in force on 1 October, 1944:—

Parktown North Nurseries, 167-169 Jan Smuts Avenue, Parktown North, Johannesburg, on *pyracantha* and mixed deciduous (part) for pernicious scale.

Iron and Manganese in Plant Nutrition.

Dr. H. L. Pearse, Western Province Fruit Research Institute, Stellenbosch.

DURING the past quarter of a century considerable attention has been paid to the rôle of the so-called trace elements in plant nutrition, and the essential nature of elements such as boron, manganese and zinc for the healthy growth of plants has been proved beyond reasonable doubt by means of controlled sand and water cultures and the use of highly purified nutrient salts. In the earliest stages of this work, however, there was much controversy as to whether these elements were really essential or not, and it was not until every possible source of contamination, culture vessels, nutrients and water had been investigated and controlled that the pathological symptoms associated with a deficiency of these elements could be reproduced at will. Notwithstanding the highly refined technique necessary to produce the characteristic deficiency symptoms caused by a lack of these elements in culture, several important economic

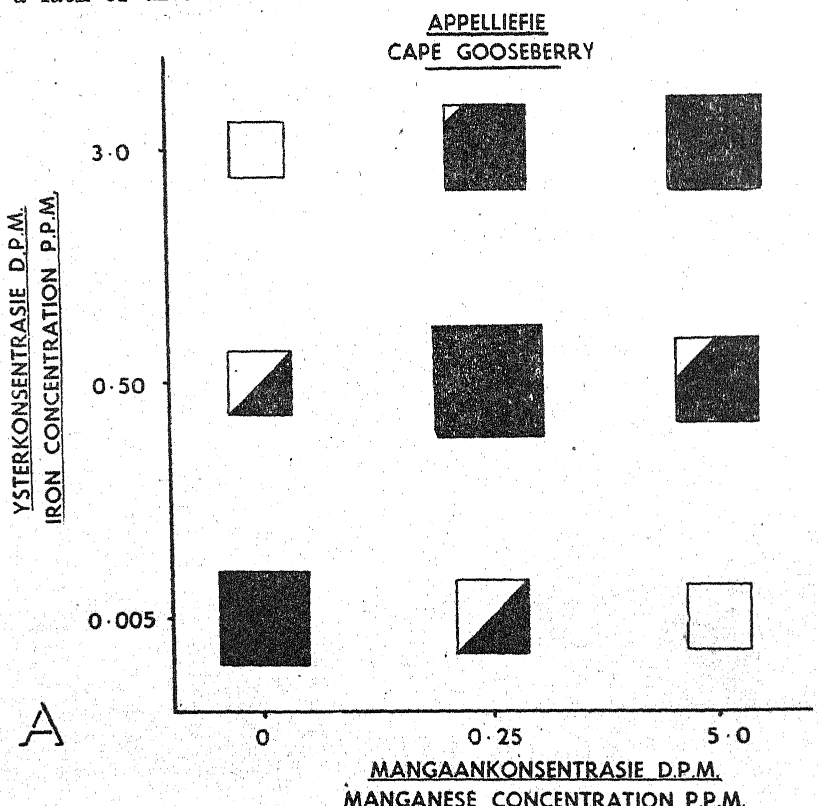


FIG. 1, A.

Diagrams A and B (opposite page) show the relationship between the concentration of iron and manganese in the culture solution, the dry weight of the plants (represented by the size of the squares) and the amount of chlorosis in the leaves (represented by portion of square unshaded).

diseases of plants have been proved to be due to a deficiency of these elements, well-known examples of such diseases being the heart rot of beets due to lack of boron, chlorosis of beans and fruit plants due to lack of manganese, and little leaf and rosette of fruit trees due to lack of zinc. In view of the extremely small quantity of these elements required for healthy growth, and the difficulty of proving their essential nature in controlled cultures, it would at first sight appear difficult to understand how there could ever be such a deficiency in the soil as to produce pathological symptoms in the plant. The explanation, of course, in the majority of cases lies in the fact that although there is more than sufficient in the soil for healthy growth, other factors are such as to render the element concerned unavailable to the plant. Thus it is fairly well known that manganese and iron deficiencies often occur on soils high in calcium carbonate or in soils which have been heavily overlimed. The need for boron also is much greater on an alkaline or limed soil than in an acid soil, and symptoms of boron starvation are much more likely to occur in the former types than in the latter.

While our knowledge of the appearance and the particular symptoms induced in many economic plants by the lack of any one of

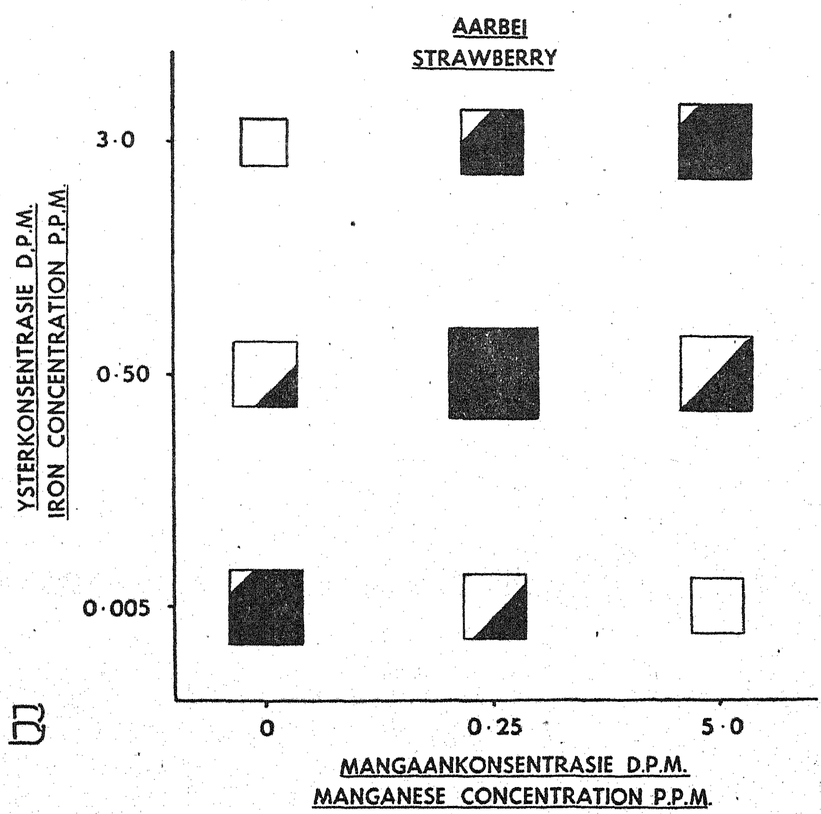


FIG. 1, B.
(See inscription on previous page.)

the elements essential for the healthy growth of the plants is now fairly complete, our knowledge of the factors leading to the production of trace element deficiencies under natural conditions and of

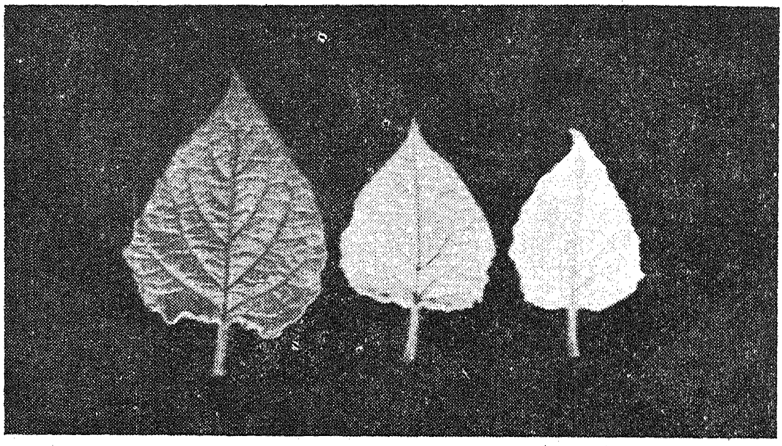


FIG. 2, A.—Cape gooseberry. Iron at low level 0·005 p.p.m. Manganese increasing. Left to right: Mn. 0 p.p.m., 0·25 p.p.m., 5·0 p.p.m.; iron deficiency symptoms (manganese toxicity) increase in severity as manganese level is raised.

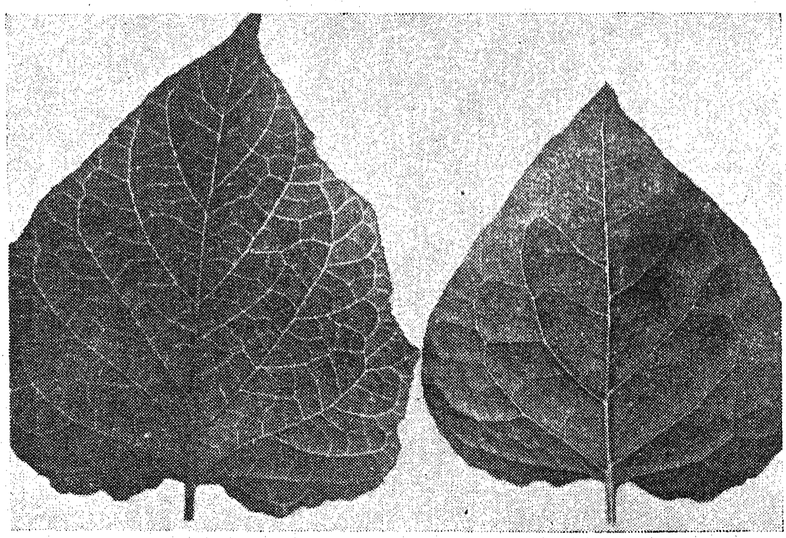


FIG. 2, B.—Cape gooseberry. Iron 0·5 p.p.m. Left: manganese 0·25 p.p.m.; correct balance; leaf healthy. Right: manganese 0 p.p.m.; leaf showing mottled appearance due to manganese deficiency.

their actual functions in plant metabolism, is still extremely scanty. In many cases where a deficiency of these elements has been noted in the field, cures have been effected by application to the soil, and, where this has failed, injection of the plant or the application of solutions by spraying to the affected plants. Whilst the value of such cures is not to be minimized, it must be borne in mind that relatively heavy doses are being applied far in excess of the plant's actual needs under ideal conditions, and that there is therefore an ever present danger of so upsetting the nutritional balance that in curing one

condition some other equally or even more detrimental condition may arise. J. W. Shive* has recently pointed out that if our knowledge of trace element nutrition is to progress, the relationships between major nutrients and the trace elements and between the different trace elements themselves in the metabolism of the plant must be investigated in detail. The intimate relationships between calcium and boron and between iron and manganese are cited as examples.

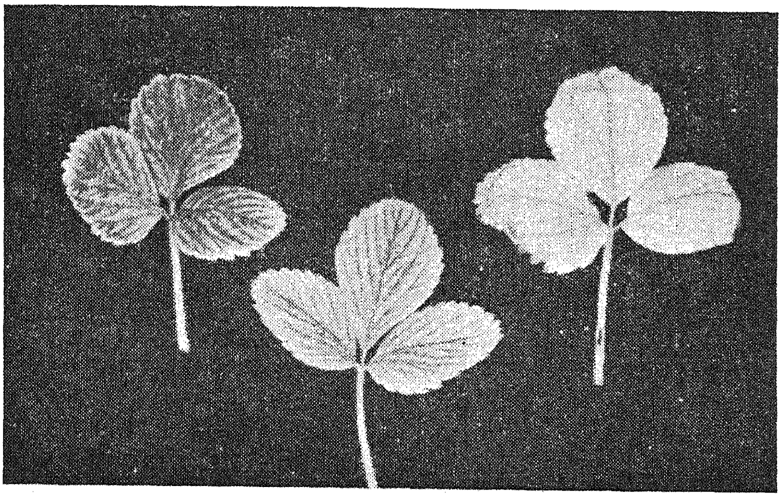


FIG. 2, C.—Strawberry. Iron at low level 0·005 p.p.m. Manganese increasing. Left to right: Mn. 0 p.p.m., 0·25 p.p.m., 5·0 p.p.m.; iron deficiency (manganese toxicity) symptoms increase in severity as manganese level is raised.

Experiments at Stellenbosch.

Sommers and Shive† have shown the importance of the correct iron manganese balance in the nutrition of the soya bean, and experiments conducted at Stellenbosch have demonstrated the intimate relationship between iron and manganese in the nutrition of two types of fruit plant. Young plants of the Cape gooseberry (*Physalis peruviana* L.) and of the strawberry (*Fragaria vesca* L.) were grown in water cultures. The water used was from a pyrex glass still and was free from any trace of iron and manganese; the major nutritional elements were supplied as calcium nitrate, potassium nitrate, magnesium sulphate, potassium phosphate, and boron, copper and zinc as boric acid, copper sulphate and zinc sulphate, respectively. All these salts were specially purified and tested for freedom from iron and manganese before use. The plants were grown in pyrex glass beakers, and the nutrient solution was automatically run through the container at a rate sufficient to keep its composition constant. Iron and manganese were added in different amounts to the various series as manganese chloride and ferrous sulphate. There were nine different treatments altogether; iron at three levels, namely, 0·005, 0·50 and 3 p.p.m., and manganese at three levels, namely, 0, 0·25 and 5 p.p.m., giving nine combinations in all. To ensure that the iron remained in solution, the solution was acidified and maintained at pH 4·6. The plants were grown in these cultures for about six weeks and at the end of that time were harvested and their

* Shive, J. W.: Plant Physiol. 16, 435-445, 1941.
† Sommers, I., and J. W. Shive: Plant Physiol. 17, 582-601, 1942.

fresh and dried weights determined. The results obtained are shown in Table 1, together with notes on the appearance of the plants, and their water contents.

TABLE 1.—*Average Fresh and Dry Weights, Water Content and Leaf Symptoms of Plants grown in Solutions containing Different Amounts of Iron and Manganese.*

(*a*) *Cape gooseberry.*

Series.	Concentration in solution.		Mean fresh weight.	Mean dry weight.	Water content percentage dry weight.	Leaf symptoms.
	Iron.	Manganese.				
	p.p.m.	p.p.m.	gm.	gm.	%	
Low iron, no manganese........	0·005	0·0	45·81	4·04	1034	Green. No chlorosis.
Low iron, medium manganese...	0·005	0·25	27·79	2·81	889	Slight chlorosis.
Low iron, high manganese......	0·005	5·0	21·33	2·26	844	Acute chlorosis.
Medium iron, no manganese.....	0·50	0·0	25·09	1·92	1207	Severe chlorosis.
Medium iron, medium manganese	0·50	0·25	55·06	5·49	903	Green. No chlorosis.
Medium iron, high manganese...	0·50	5·0	33·04	3·42	866	Slight chlorosis.
High iron, no manganese........	3·0	0·0	19·04	1·44	1222	Acute chlorosis.
High iron, medium manganese...	3·0	0·25	38·59	3·63	963	Very slight chlorosis.
High iron, high manganese......	3·0	5·0	47·23	4·80	884	Green. No chlorosis.

(*b*) *Strawberry.*

Series.	Concentration in solution.		Mean fresh weight.	Mean dry weight.	Water content percentage dry weight.	Leaf symptoms.
	Iron.	Manganese.				
	p.p.m.	p.p.m.	gm.	gm.	%	
Low iron, no manganese........	0·005	0·0	14·95	3·18	370	Very slight chlorosis.
Low iron, medium manganese...	0·005	0·25	8·48	1·95	335	Moderate chlorosis.
Low iron, high manganese......	0·005	5·0	6·32	1·47	330	Acute chlorosis.
Medium iron, no manganese.....	0·50	0·0	10·07	2·09	382	Acute chlorosis.
Medium iron, medium manganese	0·50	0·25	15·89	3·57	345	Leaves healthy green.
Medium iron, high manganese...	0·50	5·0	12·20	2·81	334	Slight chlorosis.
High iron, no manganese........	3·0	0·0	6·22	1·24	402	Acute chlorosis.
High iron, medium manganese...	3·0	0·25	9·21	2·02	356	Slight chlorosis.
High iron, high manganese......	3·0	5·0	13·10	2·93	347	Very slight chlorosis.

In the diagrams, Fig. 1 A and 1 B, the average dry weight per plant in each series is represented by a square of appropriate size, and the amount of the square left blank indicates the severity of the chlorotic symptoms.

The Leaf Symptoms.

Leaf symptoms induced by varying the balance between iron and manganese in the culture solution are shown in figures 2, A; 2 B; 2, C; and 2, D.

(*a*) Symptoms occurring when manganese is low and iron high in concentration in the culture solution.

Cape gooseberry.—In the early stages the leaves become a slightly paler green and, as the leaf expands, the green colour fades between the vein network so that the leaf assumes a characteristic mottled appearance and the vein pattern becomes indistinct (Fig. 2, B). In mild cases it is difficult to detect the early stages on the young leaves but the symptoms are clearly apparent as the leaf expands.

Strawberry.—The trouble also starts as a gradual paling of the leaf. As the leaf expands, however, and the symptoms develop, the

green colour fades first from the edges of the leaf but persists especially near the junction of the leaf blade and the petiole and along the main veins, giving a radiating pattern (Fig. 2, D). The mottled appearance characteristic of the symptoms in the gooseberry therefore does not appear.

(*b*) The symptoms occurring when iron is low and manganese is high in concentration in the culture solution.

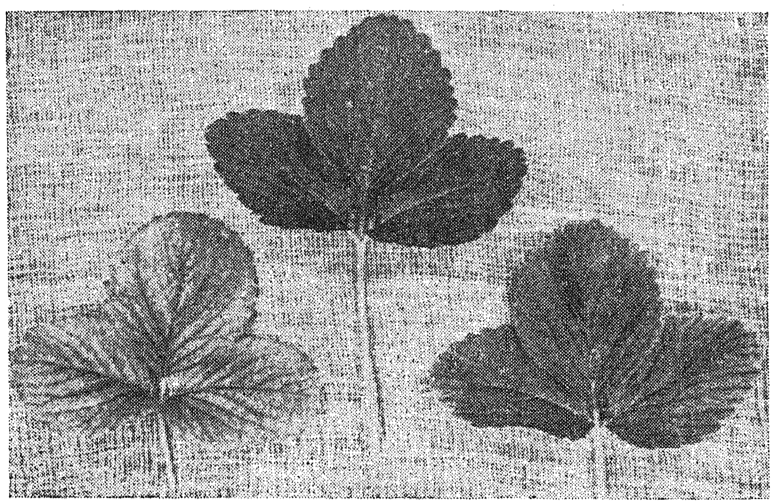


FIG. 2, D.—Strawberry. Iron 0·5 p.p.m. Left: manganese 0 p.p.m.; acute manganese deficiency symptoms. Middle: manganese 0·25 p.p.m.; correct balance; leaf healthy. Right: manganese 5 p.p.m.; slight iron deficiency symptoms (manganese toxicity).

Cape gooseberry.—The symptons are a curling and yellowing of the upper leaves of the plant, successive leaves becoming paler and paler on emergence until young leaves are almost completely white when they appear; necrotic areas also soon appear at the edges of the leaves as they expand. (Fig. 2, A.)

Strawberry.—In the early stages the green colour disappears between the fine veins especially at the edges of the leaves, and the remainder of the leaf is a pale yellowish green. Later the green colour fades except around the larger veins and in the acute stage the leaf becomes a cream colour, with just a touch of greenish yellow around the main veins; necrosis and browning also occur at the edges of the leaflets. The symptoms are most acute on the youngest leaves (Fig. 2, C).

In the experiments reported above the only varying factors were the iron and manganese contents of the solution in which the plants were grown. At the lowest level of iron where no manganese was supplied, the leaves developed no chlorotic symptoms in the case of the gooseberry and only slight symptoms in the strawberry plants, but when the iron concentration in the culture was increased (Fig. 2, B and D), acute symptoms of manganese deficiency appeared. It is apparent that this condition could be corrected in two ways, namely, either by increasing the level of manganese or by decreasing the level of iron. It is therefore clear that pathological symptoms induced by an excess of iron are identical with those induced by a lack of

manganese. On the other hand, if the level of manganese is increased when the iron level is low, acute symptoms of chlorosis appear and these are easily recognised as those caused by iron deficiency. This type of chlorosis is rectified either by reducing the level of manganese or by increasing the level of iron (Fig. 2, A and C). Symptoms induced by an excess of manganese are therefore identical with those produced by a lack of iron. It is clear, therefore, that there is an intimate relationship between iron and manganese in the nutrition of these plants. Healthy plants free from pathological symptoms of either manganese or iron deficiency can be grown at widely different levels of manganese or iron, provided the correct balance between the two is maintained. For optimum growth the ratio appears to be about two parts iron to one part manganese. When the balance varies on either side of this ratio, growth is affected before actual deficiency symptoms appear, and from the experiments it was apparent that the effective balance between iron and manganese at which deficiency symptoms will not occur was narrower in the case of the strawberry than in the case of the Cape gooseberry. In the case of the strawberry, for example, mild deficiency symptoms occurred in the low iron, no manganese solution, but not with the gooseberry. Some such relationship is probably the explanation of the appearance of manganese deficiency symptoms in some species of plants, while other species growing on the same soil show no symptoms.

It is not proposed here to discuss fully the theoretical explanation of the relationship, but it has been suggested by American authorities that if iron is to be physiologically active in the plant, it must be in the reduced or ferrous state, and that manganese is a powerful oxidizing agent. In the absence of manganese at a high level of iron, iron in the ferrous state accumulates to such an extent in the plant as to be toxic, but if sufficient manganese is present much of the ferrous iron is oxidized in the ferric state and so rendered physiologically inactive. On the other hand, if an excess of manganese is present practically all the iron absorbed is converted to the ferrous state and there is insufficient in the ferrous form for healthy growth. The opposing nature of iron and manganese in the physiology of plant growth is also reflected in the water content of the tissues. From Table 1, column 5, it is clear that increasing iron leads to an increase in the water content or a more succulent type of growth, whereas increasing manganese has the opposite effect and decreases the water content, producing a more xerophytic type of growth.

We are all aware these days of the importance of a balanced diet for health; for the health of the plant a balanced nutrition is just as important, and this is merely one more example of the equally bad effect of an excess of an essential nutrient as of a deficiency. When iron or manganese is applied, the leaf symptoms of the crop must be closely watched, for it is clear that the application of manganese when iron is deficient, or the application of iron when manganese is deficient will have a still more detrimental effect on the growth of the plant. A suspected case of iron deficiency in citrus trees in South Africa caused by excessive amounts of manganese was reported by A. C. Bathurst in *Farming in South Africa*, May 1944.

"Poultry Farming", Bulletin No. 241, *printed in November* 1943, *is out of print. A revised edition is expected to be available early next year. Only copies of the Afrikaans version are still available.*

The Influence of Soil pH on Citrus.

P. C. J. Oberholzer, Department of Horticulture, University of Pretoria.

CITRUS fruits, especially oranges, lemons, grapefruit and naartjies, are being produced in ever increasing quantities in the sub-tropical and semi-tropical parts of the world. The total world production already amounts to approximately 250 million cases of 70 lb. net weight; 165 million of these are oranges, 31 million grapefruit and 25 million lemons. The chief producing countries are: America (California, Florida, Texas, Arizona, altogether responsible for about half the total quantity), Spain, Italy, the Far East, Palestine, Brazil, South Africa and Australia. Although South Africa's contribution amounts to about 2 per cent. of the total production, the cultivation of citrus fruits in the Union is of great economic and agricultural importance. The production and export exceed that of all other kinds of fruit taken together, and in 1939 approximately 4¾ million cases were exported, representing a total sales value of about £2½ million.

The pH Value of Soil.

In South Africa, as well as in other countries, citrus fruits are cultivated under a wide range of soil and climatic conditions. If, for example, the soil factor alone is taken into consideration and only one of its characters, viz. its acidity, is determined, it will be found that this species of fruit is being cultivated over a very wide range of pH values, varying from strongly acid (pH 4) to strongly alkaline (pH 8·5 and even higher). The pH value is a logarithmic function of the hydrogen ion concentration of a solution or medium and the values extend from 0 to 14, with 7 as the " neutral point ". Values below 7 are " acid ", while those above 7 are " alkaline ". Since we are dealing with a logarithmic function, a solution of pH 4 is ten times more acid than a solution of pH 5, and a hundred times more acid than a solution of pH 6.

Most Suitable Soils for Citrus.

In considering the various citrus areas of the world it strikes one that by far the most successful orchards are found on soils which show a neutral or alkaline reaction (pH 7 to 8·5) and which are furthermore well provided with bases, especially calcium. This statement holds good for most of the commercial citrus orchards in California, Arizona, Texas, Palestine, Spain, Italy and Brazil, where the soils frequently also contain free calcium carbonate. On the other hand relatively few successful citrus orchards are found on acid soils. In this connection one naturally thinks of Florida, where citrus fruits have for many years been cultivated with a considerable measure of success on acid, sandy soils. Yet there are two important factors which should not be lost sight of in this case. In the first place very heavy fertilization is necessary in Florida, while various types of physiological-chemical problems are experienced there, such as e.g. a lack of magnesium, manganese, copper, etc. Moreover, the application of acid-forming fertilizers, such as ammonium sulphate has a very detrimental effect on these soils and the judicious application of calcium and magnesium carbonates has been recommended for some considerable time. In the second place the extremely sandy nature of these soils renders the possibility of metal poisoning on

acidification very slight, a matter which should always be kept in mind when dealing with heavy soils. In Palestine, as well as in Nigeria, acid soils are not really recommended for the commercial cultivation of citrus.

Preliminary Survey of Citrus Soils in South Africa.

As far as South Africa is concerned it would appear as though a similar general correlation might exist between soil pH and the cultivation of citrus fruits. During the past six years the writer has made a preliminary survey of the soils in our most important citrus areas and i.a. carried out pH determination in the main orchards in every area. (The determinations were made by means of a "Beckman" glass electrode on an approximately one to one soil-water-suspension). The results indicate that the most productive orchards are in general found on neutral or alkaline soils which are relatively well provided with exchangeable bases (especially calcium and magnesium) or on soils which are only slighty acid, i.e. with a pH value in the neighbourhood of 6 or higher.

In the writer's opinion the Eastern Cape Province (Sunday's River Valley, Cat River and other parts) is one of the best citrus areas in South Africa. With few exceptions the soils in this area are neutral to alkaline in reaction and frequently also contain free calcium carbonate. (In some soils the pH values exceed 8·5 owing to the presence of sodium salts, which have a detrimental effect on the growth of citrus trees. The problem of "brak" or "alkali" is well known, however, and needs no further discussion here).

The Muden area in Natal is also considered to be one of our successful citrus areas; here most of the soils are neutral-alkaline or only slightly acid (pH 6·5 to 7·5) and well provided with exchangeable bases, but mostly free from $CaCO_3$. The soils at Zebediela, Letaba and the Rustenburg area reveal a considerable degree of variation as far as pH values are concerned, but on the whole they are neutral or slightly acid, with here and there cases of considerable acidity. In addition, however, the supply of exchangeable bases is on the low side and most of the soils in these areas show a weak buffer capacity. Although most citrus orchards in these areas are relatively good, quite a number of poor orchards are found in Rustenburg, and surroundings, whereas cases of magnesium deficiency ("bronzing") occur both in Rustenburg and on the Letaba Estates. It would indeed be desirable to prevent any further acidification of soils in these areas by judicious fertilization.

The Transvaal Lowveld, and especially parts such as White River, Mayfern, Plaston and Karino, as well as the South Western Cape Province (Citrusdal and surroundings) definitely have the most acid soils on which citrus is grown. In many cases the pH is in the neighbourhood of 5·5, while there are several soils with a pH of 5 and even lower. At the same time many of these soils are extremely deficient in exchangeable bases—especially calcium and magnesium—while their absorption power and buffer capacity are also very low. Moreover, the irrigation water in these parts carries little, or generally no salts in solution, and the soils are continuously exposed to strong leaching. It may be coincidence, of course, but it is nevertheless interesting and significant that these regions, and especially the White River area, generally present most of the difficulties as far as successful citrus growing is concerned. Many orchards are unproductive, while magnesium deficiency and other

forms of disturbed nutrition occur fairly generally. Productive orchards are generally found only on light, sandy soils, such as those found at Plaston, Karino, Nelspruit and Mayfern, but in these cases "bronzing" or magnesium deficiency already constitutes a serious problem. On the heavy, acid soils of White River and surroundings citrus trees on the whole do very poorly. A further interesting phenomenon is that the nearby Kaap Muiden area, where the soils are also fairly heavy but have a neutral or alkaline reaction—most soils in this area contain free magnesium carbonate—is excellent for citrus fruits, although there are no large plantings. On the acid, sandy soils of Citrusdal citrus trees do fairly satisfactorily, although "bronzing" and other nutritional problems are also beginning to crop up. Also in this area further acidification of the soil should be energetically combated.

In conclusion it might be pointed out that while most of the citrus soils in Rhodesia show an acid reaction (pH between 6 and 7), it is only the sandy types which have a value of 5 to 6. Furthermore, most of the heavier soils are well supplied with exchangeable bases, and no outstanding nutritional problems are experienced here, except a boron deficiency. Research workers in this area apparently also realize that any further acidification of soils should be guarded against.

Danger of Unsuitable Fertilizers.

During the preliminary soil investigations it was noted that many of the citrus soils and especially those at White River and surroundings, as well as those at Rustenburg, Letaba and elsewhere, possess a particularly poor buffer capacity and can therefore very easily be acidified by i.a. applying acid-producing fertilizers. Thus, for example, it was found in a White River orchard that the pH value of the soil was reduced within three years from 6·2 to 4·5 by the annual application of about 2,000 lb. ammonium sulphate per morgen. This process of gradual acidification which takes place in many of our irrigated soils, does inestimable harm, as experience has shown in Florida and elsewhere, and should therefore be considered as a very serious problem. In this connection it should be remembered that most of our irrigable soils are still very "young", i.e. have only been cultivated for a relatively short time.

Since the pH value is affected by a considerable number of soil factors, such as moisture relations, $CaCO_3$, exchangeable bases and salts, as well as organic matter and biological activities, a direct relationship would naturally not always be expected between this soil constant and the growth and productivity of citrus trees. This is not contended either. As a rule neutral or slightly alkaline soils are more fertile than acid soils, since their base supply is larger and the biological factors (e.g. the production of CO_2, ammonia, NO_3, etc.) are also more favourable. Generally their structure is also better than that of acid soils. It may also be that certain micro-organisms flourish to such an extent in acid soils that they may act pathologically, especially if the growth of citrus trees under such circumstances is weaker than on normal soils. It would appear however, that most of the problems in regard to citrus cultivation in South Africa present themselves on acid soils and it is advisable therefore to combat any further acidification by judicious fertilizing and the use of lime and other alkaline means.

Recommendations.

The saying "Prevention is better than cure" is almost literally applicable here, since it is difficult to restore the original pH value and base status of the soils concerned by applications of lime and other materials. In citrus orchards this is an almost impossible task since such materials have to be worked in very superficially, and they move at a particularly slow rate. In parts such as the lowveld, Rustenburg, Citrusdal and possibly even Letaba and Zebediela, it is therefore desirable to discontinue applications of ammonia-containing fertilizers, and especially of ammonium sulphate, altogether, and to apply the necessary nitrogen in the form of nitrates (calcium, sodium) and of organic materials, such as kraal manure.

Peach Mildew:—

[*Continued from page* 678.

a scorched appearance. Similar spots develop on young fruits which often have the appearance of having been splashed with whitewash, this effect being due to the presence of masses of white powdery spores on the spots. The flesh of affected fruit hardens, the skin turns brownish, and the peach finally cracks. The younger the fruit is when attacked, the more severe are the effects of the disease. On infected young shoots the bark becomes dry and shrivelled, and growth is checked, often resulting in the death of the twigs.

The disease is said to thrive under almost any condition and, like various other mildew diseases, may be severe even in a hot, dry summer provided there is sufficient moisture in the form of rain or dew to germinate the spores. The fungus overwinters in the shoots and buds from which it develops, attacking young fruits, leaves and shoots. In warm areas in the Transvaal, it may infect some peach varieties at the beginning of September, but the disease is at its worst on peaches and nectarines from October onwards. Poor drainage, waterlogging, irrigation and too close planting are said to favour severity of attack.

Control.

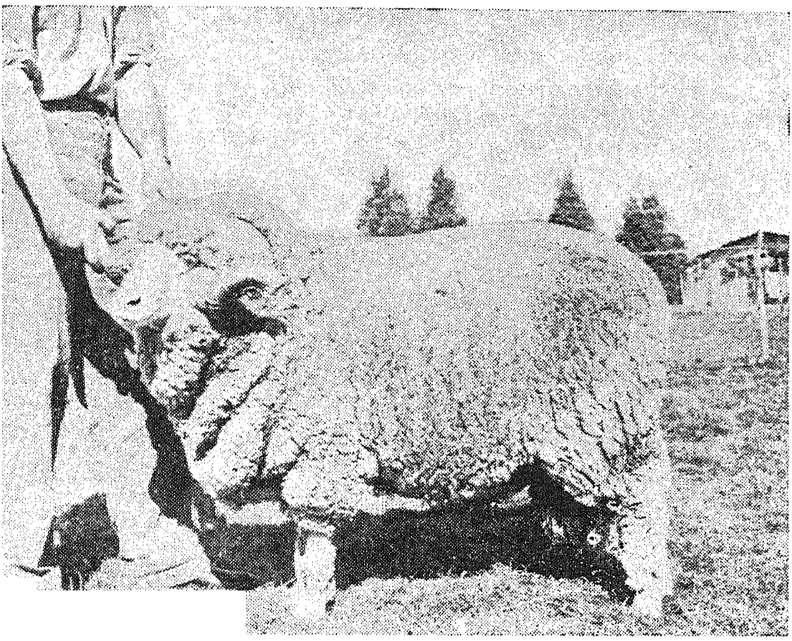
Peach mildew is very difficult to control once it has gained a hold on an orchard, and for this reason growers in areas where the disease has only just made its appearance are advised to take steps to control it before it becomes widespread. As a first step in this direction it will be found of value to remove, where practicable, early infected shoots and fruits since these provide a source of infection for healthy growth. The trees should then be sprayed or dusted with a sulphur fungicide with a view to killing the fungus spores which spread the disease. Copper sprays have not proved satisfactory, but, according to Louw, sulphur dust, wettable sulphur (5-6 lb. in 100 gallons water) and lime sulphur (1-200) have all given good results in the western Cape Province. Sprays should be applied at monthly intervals, commencing as soon as the blossoms drop, but dusting sulphur should probably be applied at 2-3 weekly intervals. Summer treatment is, however, not sufficient to control the disease and should be supplemented in winter by spraying with lime sulphur (1-15) just as the buds begin to swell.

To Clean Brown Leather.—Brown leather bags or any other brown leather goods may be beautifully polished by rubbing them well with the inside of a banana skin, and then polishing with a soft, dry cloth.

Classing and Valuation of Rams.

F. J. Labuscagne, Professional Officer (Sheep and Wool), College of Agriculture, Grootfontein, Middelburg, Cape.

ANYONE making a thorough study of the classing of rams into the various grades of excellence at our ram sales and/or on our stud farms will come to the conclusion that this work undoubtedly leaves considerable scope for improvement. It would appear that this aspect of the matter is not receiving due attention and that there is no fixed standard or guide according to which this work can be carried out.



A well-built and desirable type of ram.

Rams of a low standard or grade are sometimes found in the top classes and vice versa. Very often we find that rams which at best would have been undesirable hamels, are offered for sale and the question immediately arises whether such indiscriminate classing is done purposely or whether it is merely due to ignorance.

Our stud farmers and ram breeders generally are undoubtedly aware of the responsibility resting on them as regards the progress or retrogression of our sheep and wool industry. If they allow the sale of uncastrated culls to fellow farmers they are assisting in bringing about retrogression. Such culls can undoubtedly not be used advantageously in any flock and in these circumstances it is the duty of every stud farmer who has the interests of the industry at heart and who wishes to uphold his own reputation as well as that of his stud, to discourage the breeding and sale of undesirable rams.

In classing rams the main aim of the breeder should be to cull all animals showing disqualifications as regards conformation and/or wool and especially those having poor constitution or undesirable

skin folds and producing short wool or wool of poor quality. Such rams should be castrated, slaughtered or sent to one of our large abattoirs for slaughter.

If the standard or quality of the stud permits, rams which are approved or are serviceable can be divided into two classes, viz. flock rams and stud rams.

Flock Rams.

Rams which are used in ordinary flock for the production of hamels and flock ewes should not only be of reasonable quality but also of a suitable type. In the main, a flock ram should be plain-bodied and of a reasonably large and strong build and carry a reasonable quantity of wool of good length and quality.

In the past, flock rams were divided into two grades, special or selected flock rams and ordinary flock rams. Since all flock rams are employed for the same purpose, there is no justification for this division. Flock rams should be classed only in grades on a price or value basis according to quality and standard of excellence.

Although it is almost impossible to give a definite description of each class it may be stated that the division into various grades is mainly based on the quantity of wool in which staple length and fleece density occur in a desirable proportion. Body size and symmetry and some outstanding character or other in wool, such as particular length or high quality or a good combination of the various characters, will always be taken into account.

Moreover, it is also important to the breeder or seller as well as to the person availing himself of the services of the rams to take into account not only the grading and valuation or rams judged by outward characteristics but also the fact that a sound relationship between the value or price of the ram and the purpose for which and the class of ewe on which it is used. In the case of flock rams the price basis thus has to be in relation to that flock of sheep. The price of the latter usually varies between about £1 and £2 each.

If it is borne in mind that the average price of £1. 5s. each for good flock sheep is seldom exceeded and that such sheep seldom produce more wool than an average of 8 or 10 lb. per sheep over a period of 12 months the question naturally arises whether a price in excess of £15 each for flock rams will be profitable. As a reasonable price basis for flock rams £3 to £15 each, depending on the quality of the sheep, is recommended.

We often hear of farmers acquiring rams at between £30 and £40 each for hamel production. Such transactions can by no means be regarded as economic, if the value of flock sheep at the above prices are taken into account and, in addition, other factors such as infertility and losses due to mortality are considered.

In practice it is also noticed that the wool production of flock sheep under veld conditions in various parts of our country remains fairly constant at the average yield per sheep for the particular area. The use of rams, which produce considerably more wool than is expected from flock rams but are, nevertheless, bought at uneconomic prices, usually cannot be justified since the improvement obtained is not commensurate to the capital invested. Flock rams yielding between about 16 to 20 lb. per ram under natural conditions may be regarded as suitable for producing the ideal average weight of wool under ordinary veld conditions.

Stud Rams.

Stud rams should be of such high standard of excellence that their male progeny can be used for breeding, provided they have not some defect or other. Consequently, desirable characters of conformation, such as constitution, size, symmetry, etc., and of wool, such as length, quality, staple formation, density etc., should be present in stud animals in a high degree.

Although, as a rule, stud rams are used for the same purpose, it is nevertheless recommended that they should be classed not solely on a price basis but also into two groups, namely as "ordinary" and " special " stud rams.

Justification for this classification is to be found in the method of stud breeding, which is recommended and which corresponds more or less to a system which has been observed in some of the large studs in Australia.

In the main, studs consist of two divisions, namely an ordinary or general and a special or top stud.

The ordinary stud is commenced with a view to breeding flock rams. Although the stud rams and ewes composing this stud are of a higher standard than flock sheep, especially as regards wool production, they do not reveal any perceptible difference in type. The ewes are classed with a view to obtaining as far as possible uniformity, and a uniform set of ordinary stud rams suited to them is used. Individual mating is not regarded as essential.

The price basis of these ordinary stud rams, thus, should bear a sound relationship to the value of the majority of their progeny, namely stud ewes and stud rams, a price basis of between £25 and £75 being recommended. Classing into intermediate grades at various prices may be carried out according to merit as suggested for flock rams.

The special or top stud consists of ewes of the same type as the ordinary stud which generally have the best combination of conformation and wool characters and, in addition, are higher wool producers.

The criterion for wool production per sheep is determined by density of fleece, length of staple, size of skin area and not by density alone. Excessive wool production chiefly due to an unnecessarily high degree of density, usually is out of proportion to the level of the grazing conditions under which stud sheep are kept and can, therefore, only be properly maintained under stall conditions.

The method of individual mating is mostly applied with a view to obtaining a pedigree record of each ram and ewe and especially to facilitating selective breeding for perpetuating desirable characters and/or strains. In those cases where more than one ram is mated to the same group of ewes and the method of hand servicing or individual mating is not applied, it will be advisable, however, to employ, if possible, rams which are closely related or belong to the same strain and thus largely preclude the possibility of variation as a result of foreign strains in the sires.

Since ordinary and special stud rams and ewes are bred from this stud exclusively, it is essential to employ the best special stud rams available. As the name denotes special stud rams are of a higher standard of excellence than all other grades and classes of rams. In order to fix a reasonable price basis for special stud rams which will be in relation to their actual value and to that of common

stud rams and which will also allow for the considerable percentage of lower grade rams and ewes which usually also appear in such a stud, prices ranging between £100 and £200 and a subdivision into grades according to value are recommended.

In consequence of the higher standard requirements, the classing into the various grades will have to be based on a larger number of and more detailed particulars than in the case of flock or even ordinary stud rams. The higher the standard of the rams the more their outstanding characters are appreciated and for this reason the wider range in price basis is recommended.

It is possible, of course, that isolated cases may occur in which rams of outstanding quality are produced, particularly in the special stud. Such rams may then be valued at special prices according to merit. Similarly the lower grade rams from the special stud are placed in the appropriate classes.

The average price basis of about £10, £50 and £150 for flock rams, ordinary stud rams and special stud rams respectively should be regarded as reasonable, if the purpose for which each class of ram is used is taken into account.

But for a few exceptional cases there actually appears to be no justification for higher maximum prices than those recommended.

Our stud and flock sheep farmers should not lose sight of the keen competition from other sheep breeds, cross-bred sheep and artificial wool with which our merino sheep industry has to contend. In their own interests they should not demand or pay fancy prices for rams since such prices partly account for the injudicious cross-breeding of merino with mutton breeds and also for the over-capitilization of our flocks which, as a result of the high production costs, exercise a hampering influence on the competitive value of wool.

If the above hints and the proposed price basis are considered in relation to each group, they should not only serve as a guide for the classing and valuation of rams but also contribute towards the improvement and maintenance of the standard of our flocks on a more economical basis and so bring about some reduction in the production costs of wool.

Most farmers to-day realize the necessity and value of standardization in our wool industry and will undoubtedly welcome the application of standardization in our breeding industry in as far as it is practicable. Such a scheme can, however, only be successfully carried out, if it has the whole-hearted support of our stud and flock farmers.

Nevertheless, a serious effort should be made to secure a certain degree of uniformity in the classing into grades and in the valuation of rams not only in respect of the three main groups but also as regards the sub-division of each group into intermediate grades.

"Foods and Cookery", Bulletin No. 115, is out of print.

Bulletin No. 237, "Eggs and Poultry in Cookery", which contains many useful recipes, is obtainable at 6d. per copy from the Editor.

The Effect of Methyl Bromide Fumigation on Apples.

Dr. W. E. Isaac, Government Low Temperature Research Laboratory, Cape Town.

BEFORE the war most of our export apples were sent to Britain and, since Britain already has the widely distributed codling moth (*Cydia pomonella* L.), no special sterilization measures were necessary. Kenya and Rhodesia were recognised as possible supplementary markets, but since the codling moth is absent in these countries, they insist that, if fruit is to be imported from the Union, the danger of introducing a new insect pest must be eliminated.

FIG. 1 A.—External methyl bromide injury to Granny Smith apples.

Since it is possible for small punctures in fruits to be overlooked by fruit inspectors, it therefore became necessary to adopt a means of killing larvae (and eggs) without at the same time causing injury to the fruit. With this end in view Dr. R. G. Nel of the Division of Entomology carried out experiments to establish suitable treatments with methyl bromide for killing codling moth eggs and larvae. It was found that a dose of 2 lb. of methyl bromide per 1,000 cubic feet chamber space for two hours (2/2) was adequate, as were also doses of 1 lb. methyl bromide per 1,000 cubic ft. chamber space for 12 (1/12), 6 (1/6) and even 2 hours (1/2), although the last concentration is on the borderline of effectiveness. It then became necessary to investigate the effects of these concentrations of methyl bromide on different varieties if South African apples. This was all the more necessary as Phillips and Monro had shown that some apple varieties are injured by moderate doses of methyl bromide. Out of seven apple varieties tested by Phillips and Monro two showed injury when fumigated with 2½ lb. of methyl bromide per 1,000 cubic feet "of vault space" for 90 minutes. (Phillips and Monro, 1939.) An additional treatment to those indicated above was included in these tests, namely, 3 lb. of methyl bromide for six hours (3/6).

Investigations Carried Out.

The investigations carried out are limited in regard to the number of seasons during which tests have been made and also in regard to the number of farms from which apples for the tests were obtained. Furthermore, only apples from the Elgin district were tested. In spite of these limitations the present interest of the subject was thought to merit a short statement.

The tests made are listed in Table 1. The fumigation treatments were carried out by Dr. R. G. Nel.

TABLE 1.—*Tests carried out to ascertain effects of methyl bromide fumigation on apples.*

Variety.	Methyl bromide treatments (lb. methyl bromide per 1,000 cubic ft. chamber space per length of fumigation period)	Subsequent storage temperature
		°F.
Ohenimuri—		
(i) 1941	1/6, 1/12	32, 35, 45
	2/2	32, 35
(ii) 1942	2/2, 3/6	35
Granny Smith	1/6, 1/12, 2/2	32, 35, 45
York Imperial	2/2	35, 35
Pearmain	2/2, 1/12	35
Rokewood	2/2, 1/12	35
Red Delicious	2/2	35
	3/6	35, 45

Examination was made after a month or 6 weeks in storage, and in the case of some lots further periodical examinations were made up to three months in storage. Usually the apples were examined immediately on withdrawal from storage and again after about a further week (sometimes 2 weeks) at 65° F.—70° F. *Except where specifically stated to the contrary, the comments made refer to apples kept at 65° F. —70° F. after withdrawal from storage.*

In addition to the above tests, apples were examined from an experimental consignment of fumigated apples sent in 1943 to the Salisbury Cold Store, Southern Rhodesia. The consignment comprised, in addition to controls and fruit subjected to the 2/2 treatment, apples subjected to 2 lb. methyl bromide per 1,000 cubic feet of chamber space for 1½ hours (2/1½). The bulk of the consignment consisted of White Winter Pearmain apples (196 boxes), but 18

TABLE 2.—*Summary of effect of methyl bromide fumigations on the apples tested.*

(The figures given do not include apples injured only very slightly.)

Variety.	Incidence of methyl bromide injury. (lb. methyl bromide per 1,000 cu. ft. chamber space per length of fumigation period.)			
	2/2 (and 2/1½).	1/6	1/12.	3/6
Ohenimuri	Negligible, except in 1 box which showed 12% injury	Max. of 11%	Max. of 17%	Nearly 100%.
Granny Smith	14 to over 50%	Up to 52%	Up to 91%.	—
Red Delicious	Up to 25%	—	—	100%.
Rokewood	Max. of 3%, mostly no injury	—	Over 30% at end of 1 month. Up to 85% after 3½ months in storage	—
Pearmain	Max. of 5%	—	Max. of 5%	—
York Imperial	No injury	—	—	—
Golden Delicious	No injury	—	—	—

boxes each of Ohenimuri, Granny Smith and Golden Delicious were also included. The Granny Smith apples were subjected to about 2 weeks pre-fumigation delay.

Lastly, in 1944 an examination was made of two consignments of Granny Smith apples subjected to the 2/2 treatment.

The effects of the various methyl bromide treatments on the different apple varieties are summarized in Table 2.

Granny Smith apples showed considerable injury with all the methyl bromide treatments tested, except in the case of certain lots of apples subjected to various pre-fumigation treatments. The pre-fumigation treatments included a delay of about two weeks between picking and treatment, but these tests were too tentative to merit further detail. Taken by and large, they indicate the possibility, under certain conditions, of fumigating Granny Smith apples without injury. It must be stressed, however, that this variety is very liable to methyl bromide injury and that a pre-fumigation delay period may not necessarily prevent it.

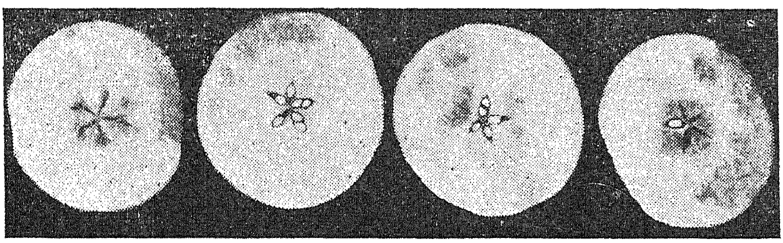


FIG. 1 B.—Externally injured Granny Smith apples cut across to to show injury to flesh.

Red Delicious also proved to be very senitive to methyl bromide. Injury was apparent on removal of the fruit from storage, and subsequent holding of the fruit at 65°-70° F. resulted in little or no increase in the number of injured apples. Fruit subjected to the 3/6 treatment and stored at 45° F. for 30 days was not transferred to a higher temperature since it showed 100 per cent. injury on withdrawal from storage.

The difference in the amount of injury noted immediately on removal of the fruit from storage and after a further period at a higher temperature was sometimes small, as has already been noted for Red Delicious apples. Sometimes, however, the difference was considerable. Thus, the respective values for Rokewood subjected to the 1/12 treatment and then stored at 35° F. for one month were 5 and 31 per cent. In general, the difference was least where the percentage of affected apples was greatest. *In assessing methyl bromide injury to apples, however, it is necessary to keep them for some days at a higher temperature after withdrawal from storage.*

Judging from the colour and flavour, some stimulation of ripening was obtained with Ohenimuri and Pearmain apples. Methyl bromide had at best only a slight stimulating effect on the ripening of Red Delicious and Granny Smith, while judged by the criteria mentioned above, this fumigant has no effect on the ripening of Rokewood and York Imperial.

This matter needs further investigation since a permanent stimulation of ripening would imply a shortened storage life for fumigated apples. An initial stimulation of ripening, however,

if not sustained, might have very little effect. In this connection mention might be made of the work of Knott and Claypool on tomatoes. These workers studied the effect of methyl bromide fumigation on respiration. They found that methyl bromide fumigation brought about an initial stimulation of respiration, but this effect was not sustained, and later the rate of respiration fell below that of the controls. This they regarded as affording the key to the ripening behaviour observed, since, at the end of the tests, the control tomatoes were in many cases found to be riper than those fumigated with methyl bromide. (Knott and Claypool, 1941.)

Conclusions.

From the results presented certain general conclusions can be drawn:—

(1) The 3/6 methyl bromide treatment is consistently injurious.

(2) The 2/2 methyl bromide treatment was satisfactory with Ohenimuri, Pearmain, Rokewood and York Imperial apples. It would seem that this is also true of Golden Delicious, but this variety was not tested as thoroughly as the others listed. Further work may demand a modification of this statement.

(3) Even the 2/2 methyl bromide treatment results in decided injury with Red Delicious apples.

(4) The behaviour of Granny Smith subjected to the 2/2 treatment is erratic, and, until further tests have been made, it is unsafe to fumigate this variety.

(5) According to the tests so far carried out, the 1/6 and 1/12 treatments would seem to be safe only with Pearmain apples.

Nature of Methyl Bromide Injury.

In order to avoid possible confusion and to make the issue as straightforward as possible, methyl bromide injury has been referred to as though it were of one kind. This is not so. Methyl bromide may affect the skin, and sometimes also the outer layers of the flesh, or it may injure the tissues of the core region. Frequently both kinds of injury may occur in the same fruit. External and internal (core) injury were indicated and figured (but not described) by

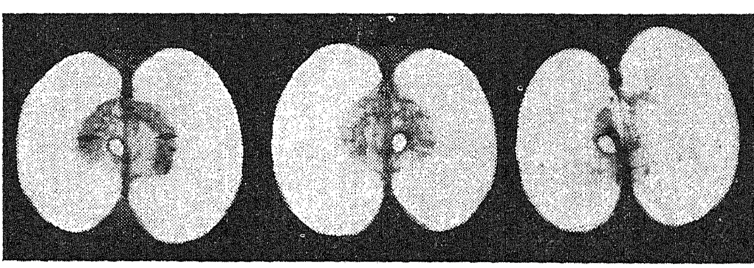


FIG. 2.—Granny Smith apples cut to show methyl bromide injury to core.

Phillips, Monro and Allen (1938) for McIntosh apples. Phillips and Monro (1939) subsequently reported only external injury for McIntosh and Jonathan apples subjected to 2·5 lb. of methyl bromide per 1,000 cubic feet of vault space. "Wealthy" apples subjected by Chapman (1940) to 2 lb. methyl bromide per 1,000 cubic feet for 4 hours, and to 4 lb. doses for 2 and 4 hours, showed external injury. He reports that: "In the 4-lb. 4-hour lot the fruit appeared

as though it had been scalded. In other lots the injuries occurred in the form of spots, often centring around bruises ". No mention is made of internal injury. Referring to methyl bromide injury in four varieties of Californian apples, Mackie and Carter state that: "The symptoms of treated fruit closely approached those noted when 'bitter pit' was present." In Granny Smith the present writer observed a third type of injury which spreads outwards along vascular tissue from the ten vascular bundles situated at intervals

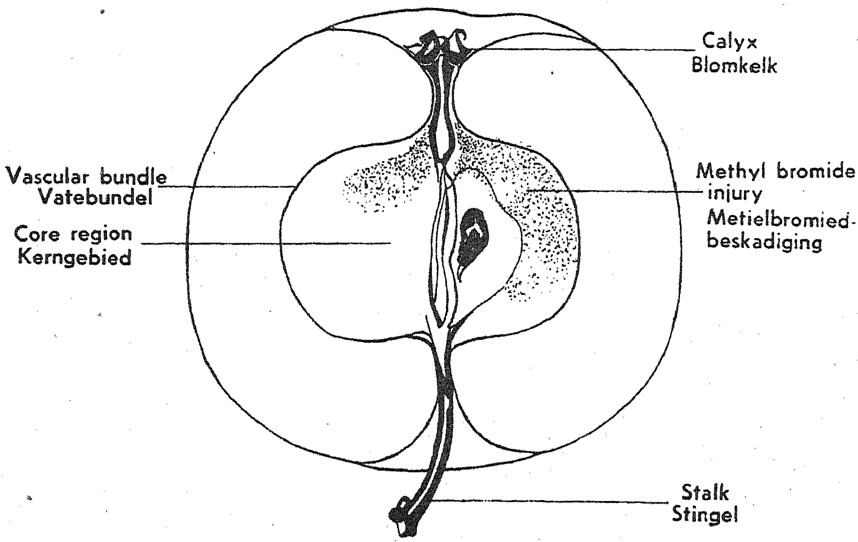


FIG. 3.—Diagram of apple in vertical section showing methyl bromide injury to core.

around the core. The flesh may be affected to a greater or lesser extent. The descriptions given below refer only to observations made on South African apples.

Surface injury may be evident as brown spots (Red Delicious, Rokewood), or as irregular brown areas of varying size which may be slightly sunken. The outer flesh may also be affected, as shown in Fig. 1 B. More rarely, the injured areas may show a markedly uneven surface. What determines the development of surface injury, is by no means clear, but it would seem that certain types of abrasions and bruises render the surface more liable to injury.

The typical primary internal injury is damage to the core tissues (Fig. 2). The injury almost invariably arises at the calyx end of the core, indicating an easy entrance for methyl bromide vapour by this route. The injury is frequently confined to the calyx end, but it may spread downwards towards the stem end of the core and outwards from the core to the outer flesh (Fig. 3).

It is well to consider similarities and differences which these injuries may have to storage disorders with which they might be confused. When the external injury involves the skin only, it is frequently similar in appearance to superficial scald (Isaac, 1942 B), especially to the superficial scald that develops at low storage temperatures—frigescence superficial scald (Isaac, 1942 A). There are, however, two important differences between methyl bromide

injury to the surface of the apple and superficial scalds. While superficial scalds have definite storage temperature relationships, methyl bromide injury develops at all storage temperatures. Secondly, fumigation injury develops within the first week or so following treatment, while the superficial scalds only appear later in the storage life of apples. Core injury approximates to core flush (Isaac, 1942 B), but again differs in that it develops much sooner and also in that its first location is at the calyx end of the core and its downward development towards the stem end. In experimental work any possibility of confusion is circumvented by comparison with unfumigated apples from the same consignment.

In one consignment of Granny Smith apples a third type of injury was noted. Here the methyl bromide vapour would seem to pass upwards from the stalk end and out along the ten vascular

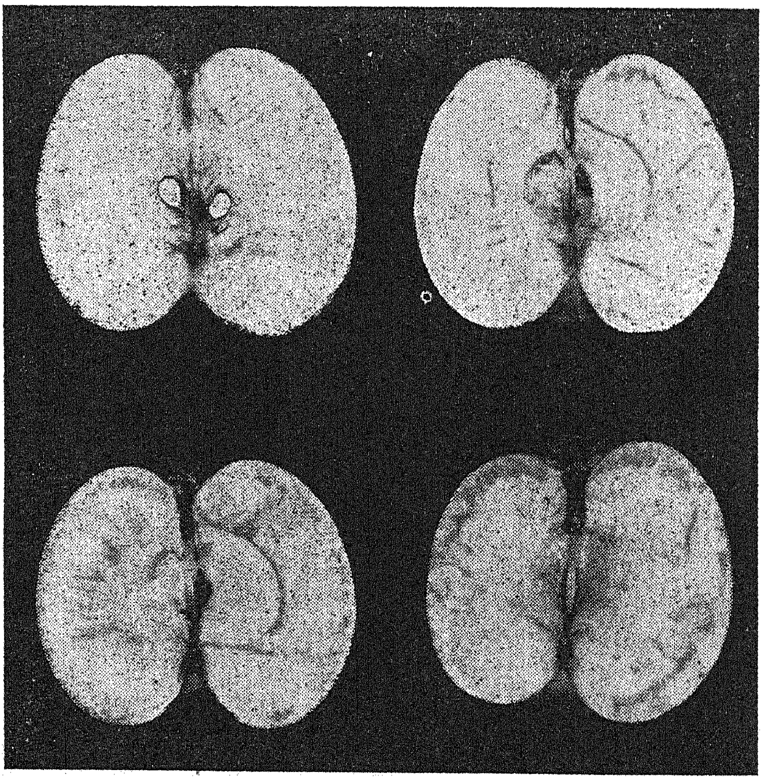


FIG. 4.—Granny Smith apples showing methyl bromide injury spreading from the vascular bundles around the core.

bundles around the core. From there the outer flesh was affected to a greater or lesser extent (Fig. 4). Large apples would seem to be more susceptible to injury than smaller apples.

It is important to notice that apples which are externally sound may yet show internal injury. Thus, *the absence of external injury is no certain indication of the absence of methyl bromide damage.* This is illustrated by an example in Table 3.

TABLE 3.—*Granny Smith apples fumigated with 2 lb. methyl bromide per 1,000 cu. ft. chamber space for two hours and held at 70° F. for 1 week after withdrawal from storage. (Three weeks at 36° F.)*

Count size.	External injury.	Medium and severe internal injury of externally sound apples.
A.—Consignment 1.	%	%
216	28	14
198	22	30
198	30	21
163	22	48
163	19	36
138	19	39
B.—Consignment 2.		
175	2	11
163	6	9
150	7	12
125	10	17
100	3	39
100	1	23

Although the presence of external fumigation injury does not necessarily indicate internal injury, externally injured apples are liable to show a higher incidence of internal injury than externally sound apples (Table 4).

TABLE 4.—*Comparison of internal injury (medium and severe) in externally sound and externally injured (medium and severe) fruit from the same consignment of Granny Smith apples.*

Count size.	Internal Methyl Bromide Injury.	
	Externally sound apples.	Externally injured apples.
	%	%
216	14	60
198	30	45
198	21	45
163	48	56
163	36	61
138	39	64

General Conclusions.

1. The results of experiments so far carried out indicate that it is safe to fumigate the following apple varieties with 2 lb. methyl bromide per 1,000 cu. ft. chamber space for 2 hours: Ohenimuri, Pearmain, Rokewood and York Imperial.

2. Even at low concentration, methyl bromide fumigation is injurious to Red Delicious and apt to be very injurious to Granny Smith apples.

3. Injury may affect the core or outer parts of the apple or both.

The absence of external injury is no guarantee of the absence of internal injury.

4. Large apples are more susceptible to injury than small fruits.

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Save Transport.

Tyres and speeding :—Everyone knows, or should know, that wear and tear on tyres and petrol consumption greatly increase with extra speed. Excessive speed is not a common fault among motorists to-day because they know that it burns up their almost irreplaceable tyres. Nevertheless, cars are sometimes overturned and wrecked as the result of speeding. That sort of thing is little short of sabotage.

The carburettor :—Unless you really know what you're about, don't tinker with the carburettor in an effort to increase mileage. The amateur, who is often ignorant of the principles governing the operation of his own particular carburettor, usually contents himself with weakening the main jet mixture, unmindful of the fact that it is also necessary to alter most of the carburettor settings in order to balance the mixture and to ensure accurate carburetion at all throttle openings. There is little advantage in weakening the main jet mixture if the compensating and low-speed jets are left over-rich. If you feel that you are justified in expecting a higher mileage, consult your garage.

Useful Hints for Housewives.

To Revive Black Lace.—Make some black tea of about the usual strength for drinking and strain off the leaves. Pour enough tea into a basin to cover the material and let it stand for 10 to 12 hours. Then squeeze the lace several times but do not rub it. Dip it frequently into the tea, which will at length assume a dirty appearance. Have some gum water ready and press the lace gently through it. Roll it in a cloth and pat it well. Then pin it into a towel in the shape you wish it to take. When the lace is nearly dry, cover it with another towel and iron with a lukewarm iron on the wrong side.

To Clean Marble.—When marble is very discoloured, mix together equal parts of soft soap, lime and caustic potash and apply the mixture with a brush. Leave it on for several days, after which it must be brushed off.

Worms in Sheep, Goats and Cattle.

Different Types and Their Control.

Dr. H. O. Mönnig, Onderstepoort.

IN South Africa, especially in the summer-rainfall area, worms play an important rôle in sheep-farming, since a warm, moist climate is favourable to these parasites. Worms undoutedly cause more losses in sheep than do all other sheep diseases combined. Not only do many sheep die as a result of worm infection, but much loss is also occasioned by deterioration in the quantity and quality of the wool, and in the growth, health and procreative qualities of the sheep, while the ewes' milk supply is impaired, resulting in the lambs being given an unfavourable start in life.

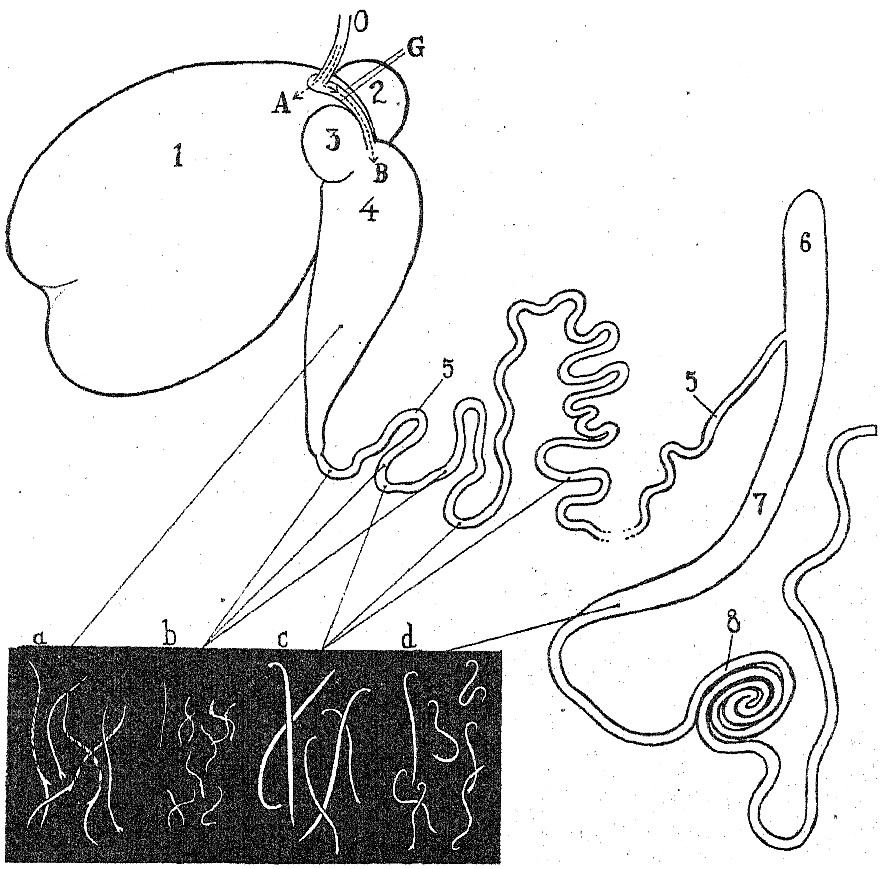


Fig. 1.—Stomach and intestines of sheep and most important worms.—1, Large stomach (rumen); 2, honeycomb (reticulum); 3, manifold (omasum); 4, milk stomach (abomasum); 5, small intestine; 6, 7, 8, large intestine; 6, blind gut; 8, spiral gut; a, wirewurm; b, bankruptworm; c, hookworm; d, nodular worm; O, gullet (oesophagus); G, edges of oesophageal groove—remedy goes to A when groove is open and to B when it is closed—closure of groove is caused by nerves which can be stimulated in the mouth of the animal, by bluestone in sheep and goats and by salt in cattle.

It is not adequately realized how important is the comparatively small difference between sheep of passable appearance and those in the pink of health, which is the ideal condition; that this little difference means a loss to the country of thousands of pounds annually and that worms are almost invariably the cause thereof.

Occurrence of Worms.

All the worms lay eggs, which are usually passed out in the sheep's faeces. These eggs can only develop further in warm, moist conditions; some require more moisture than others. Many of the eggs hatch, and the resulting young worms live in the grass, together with which they are again taken into the intestines of the sheep. In other cases, the worms hatched out of the eggs have first to pass through an intermediate host, the water-snail, for example, before they can infect sheep. Dogs also harbour worms with which sheep may be infected.

FIG. 2.—Liverfluke.

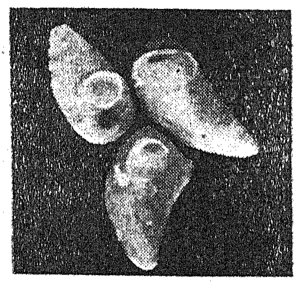


FIG. 3.—Conical fluke.

The circumstances in which infection occurs vary greatly, but the following factors are favourable to the spread of worms: wet pasture, warm weather, overstocking and the drinking of stagnant water in dams and pools on the veld. Therefore summer is the most dangerous time of the year.

Young animals and animals in poor condition are the most susceptible to worm infection.

When a worm-infected animal is opened, much water is sometimes found in the abdominal and pectoral cavities and in the heart-sac. For this reason, cases of worm infection are sometimes mistaken for heart-water, and vice versa. The absence or presence of worms would confirm the diagnosis. In such cases of worm infection, the body-fat is usually replaced by a jelly-like substance.

It is advisable to kill poor-conditioned sheep from time to time in order to ascertain what types of worms are infesting the farm. For this purpose the following list will be of great value, all the types being subsequently dealt with. Usually more than one kind occur simultaneously in an infected animal:—

Part of Animal.	Worm. (Popular name.)	Scientific Name.	Sheep and Goat.	Bovine.
Under eye-lid..	Eye-worm.............	*Thelazia rhodesii*..........	—	+
Stomach cavity	—	*Setaria cervi*..............	—	+
,, ,,	Long-necked bladder-worm	*Cysticercus tenuicollis*......	+	+
Intestinal veins	Bilharzia worm.........	*Schistosoma bovis*..........	+	+
Gullet..........	Zig-zag worm...........	*Gongylonema pulchrum*.....	+	+
Rumen.........	Zig-zag worm...........	*Gongylonema verrucosum*...	+	+
,, ...	Conical fluke...........	*Paramphistomum cervi*.....	+	+
Abomasum.....	Wireworm..............	*Hæmonchus contortus*......	+	+
,, ...	Brown stomach worm..	*Ostertagia*-species..........	+	+
,, ...	Bankrupt worm.........	*Trichostrongylus axei*......	+	+
Small intestine	Bankrupt worm.........	*Trichostrongylus*-species....	+	+
,, ,,	Bankrupt worm.........	*Cooperia*-species..........	Seldom	+
,, ,,	Long-necked bankrupt worm	*Nematodirus spathiger*.....	+	Seldom
,, ,,	Sandveld hookworm.....	*Gaigeria pachyscelis*.......	+	—
,, ,,	Grassveld hookworm....	*Bunostomum trigonocephalum*	+	—
,, ,,	Grassveld hookworm....	*Bunostomum phlebotomum*..	—	+
,, ,,		*Ascaris vitulorum*.........	—	+
,, ,,	Young conical flukes....	*Paramphistomum*.........	+	+
,, ,,	Milkworm..............	*Moniezia*-species..........	+	+
,, ,,	Narrow tapeworm.......	*Avitellina centripunctata*...	+	+
Large intestine	Nodular worm..........	*Oesophagostomum columbianum*	+	—
,, ,,	Nodular worm..........	*Oesophagostomum radiatum*	—	+
,, ,,	Whipworm.............	*Trichuris*-species..........	+	+
,, ,,	Large-mouthed worm...	*Chabertia ovina*...........	+	+
Lung..........	Lungworm.............	*Dictyocaulus filaria*........	+	—
,, ...	Lungworm.............	*Dictyocaulus viviparus*.....	—	+
,, ...	Lungworm.............	*Muellerius capillaris*.......	+	+
,, ...	Bladderworm...........	*Echinococcus*.............	+	+
Liver..........	Liverfluke.............	*Fasciola hepatica*..........	+	+
,, ...	Liverfluke.............	*Fasciola gigantica*.........	+	+
,, ...	Liver tapeworm........	*Stilesia hepatica*..........	+	+
Brain cavity...	Gid bladderworm.......	*Multiceps multiceps*.......	+	+

From the above list it appears that in most cases the same species of worm occurs in both sheep and goats as well as in cattle, except that, in the case of the most important species, the hookworms, lung-worms and nodular worms, those occurring in sheep and goats are not the same as those found in cattle.

Three Different Classes of Worms.

There are three different classes of worms—Flukes (*Trematoda*), Tapeworms (*Cestoda*), and Round or Threadworms (*Nematoda*).

I. Flukes *(Trematoda)*.

Life-cycle.—The eggs of flukes are discharged in the faeces of the sheep, and hatch on the veld only when the weather is warm and there is sufficient moisture, otherwise they die. The young worm lives only 24 hours, unless it finds a suitable host, i.e., the right kind of watersnail. It burrows into the snail, where it grows for a few weeks, and multiplies, so that in due course numerous young worms emerge from the snail. They swim about in the water and, in the case of *Schistosomum*, are now able to infect sheep. In other cases, they sink down in the water or crawl up on the grass, where each worm forms a small protective shell wherein it is able to live for several months (liverfluke and conical fluke). Animals then ingest them while eating grass or drinking water.

Liverfluke.

There are three species of flukes, which are distinguishable as follows:—

The liverfluke (Fig. 2), is a greyish-brown, leaf-shaped, flat worm, $\frac{3}{4}$ to 2 inches long (there are two kinds), which lives in the bile-ducts of the liver of sheep, goats, cattle, game (buck), horses, pigs, hares and various other animals.

The worms are blood-suckers, and cause acute anaemia, as a result of which the membranes of the eye and mouth become pale; the sheep gets weak, feeds badly, and its wool loosens; its blood turns

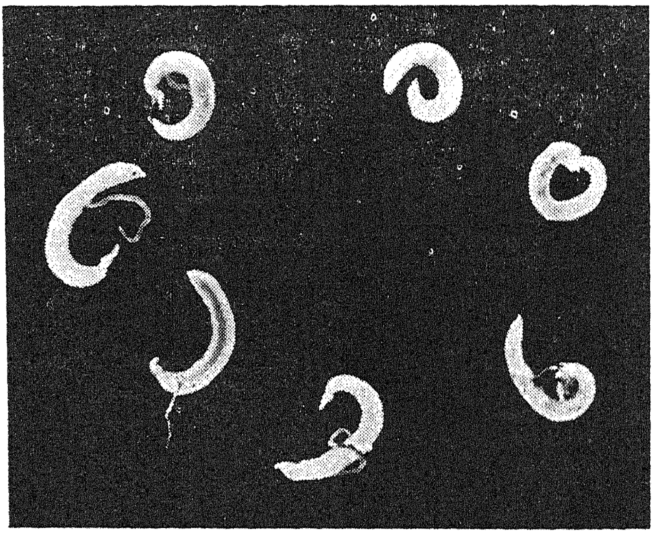


Fig. 4.—*Schistosomum*.

watery, for which reason a post-mortem examination reveals water in the abdominal and pectoral cavities and in the heart-sac; the body-fat is replaced by a jelly-like substance (therefore infected sheep have not a lean appearance); the liver is hard, with an uneven surface and the distended bile-ducts are perceptible; when the liver is cut and squeezed, the worms emerge from the bile-ducts. The life-cycle is as described above and infestation thus only takes place in wet places where watersnails abound.

Remedial measures: (*a*) Keep the animals from wet places in the pasture. (*b*) Treat the infected animals as follows: For a period of one week before to one week after dosing the remedy, the animal should be run on ordinary grassveld, and if some other feed is required, maize should be given. Protein-rich feeds such as beans and lucerne, and also fatty feeds such as oil-cake should definitely not be fed. Some shrubs are dangerous and the farmer will be well advised not to run his animals on such veld. Should grassveld not be available, he should feed his animals hay (not lucerne hay). In those cases where his veld is deficient in calcium he should give bonemeal licks. In treating his animals he should keep them calm and not drive them far after the treatment. He should not treat them on an excessively warm or cold day and not treat animals which are very fat or very lean at all. Moreover, it is not desirable to treat ewes with lamb at

foot or cows which are heavy producers, since milk removes much calcium from the body and thus renders the treatment dangerous. It is not necessary to keep the animals away from grazing and water either before or after dosing.

Pure carbon tetrachloride is mixed with liquid paraffin or with any other mineral oil (not raw linseed-oil) in the proportion of one to four parts per volume. A full-grown sheep or goat is carefully injected with 5 c.c. in the mouth and a lamb of from 6 to 12 months old with 2½ c.c. The remedy can also be administered in separated milk instead of with liquid paraffin, but since the remedy does not mix with milk, every dose must be drawn up separately into the syringe, first the one c.c. tetrachloride and then the 4 c.c. milk.

After an interval of 4 to 6 weeks the treatment should be repeated. Should liverfluke be very troublesome the farmer would be well advised to treat his animals every year during the months of October-November and April-May.

Cattle are most susceptible to carbon tetrachloride poisoning but may be treated with it if the protective measures described above are

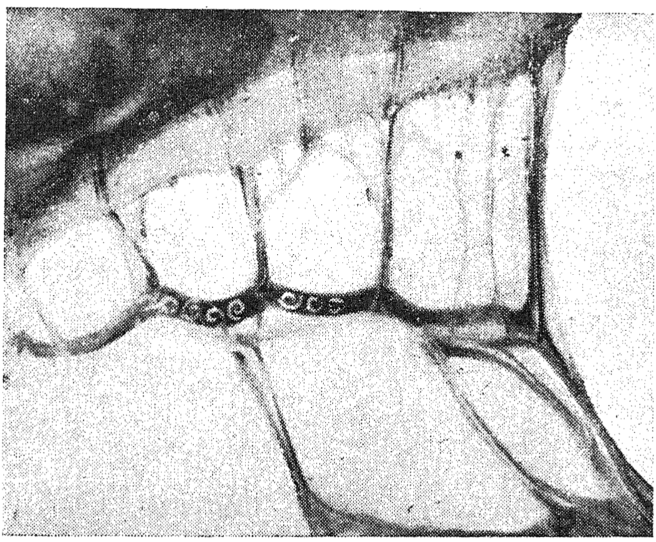


FIG. 5.—Veins of intestine.

carefully applied. They should be fed more specially on bonemeal and maize. Dairy cows which produce heavily should not be treated. The dose for cattle is 2 to 4 c.c. carbon tetrachloride, to which has been added four times as much oil or separated milk.

(c) After the treatment the farmer should feed the animals a lick consisting of salt and bonemeal, to which has been added 3 lb. of iron sulphate to every 100 lb. of lick. Where sheep have access to "brak" and do not readily eat salt, less salt should be added to the mixture, so that 100 sheep would ingest about 1 lb. of iron sulphate per week.

(*d*) Drain the wet places or fence them off, as they are a source of infection by other worms as well. (*e*) Exterminate snails with blue vitriol. In the case of stagnant water, estimate the quantity of water and add a concentrated solution of blue vitriol, about two parts to a million of water (2 lb. to 100,000 gallons). In the case of a

large pan or vlei, the vitriol may be mixed with sand and cast around the pan or over the whole vlei, using about 15 lb. of vitriol to half a morgen. Before rain has fallen, no animals should be allowed to graze at those places where the vitriol has been cast. In the case of running water, a small bag containing blue vitriol can be suspended in the water, so that the water may dissolve the vitriol and carry it away; the quantity should be calculated on a basis of about 1 lb. per 100,000 gallons of water per hour.

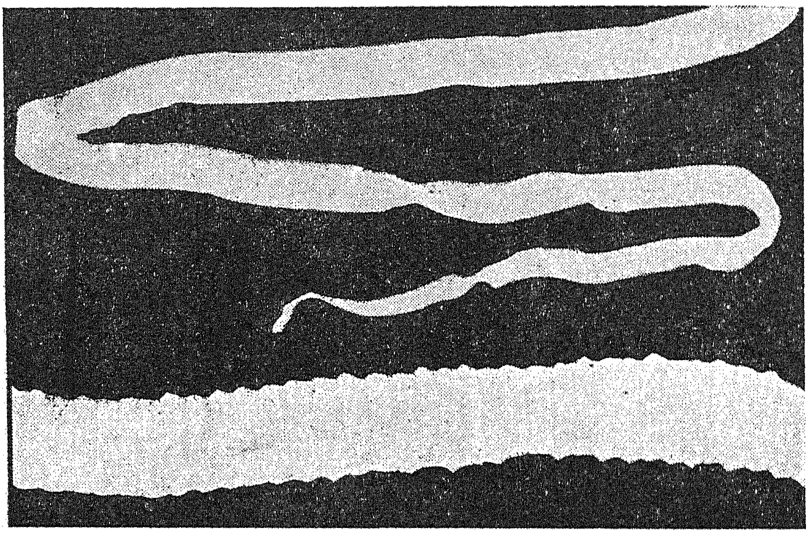


FIG. 6.—Sections of milkworm; enlarged.

The farmer must be careful not to use an excessive amount of vitriol since this may have an injurious effect on plants and large animals. The quantity stated kills fish and green scum in dams. The vitriol treatment is best applied in spring and should be repeated after 2 months.

The Conical Fluke.

The conical fluke (*Paramphistomum*) (Fig. 3) is a red, pear-shaped worm, $\frac{1}{4}$ to $\frac{1}{2}$ inch long, and has, at its thicker end, a large sucker by means of which it adheres to the inner surface of the infected animal's stomach. The adult worms live in the rumen and reticulum of sheep, goats, cattle and game (buck).

When an animal becomes infected, the young worms first enter the milk-stomach and intestines, where they live and develop for a while, and then crawl back into the rumen. While in the milk-stomach and intestines, the young worms resemble small red grains.

The adult worms do no damage, but the young ones, when they are numerous, cause acute diarrhoea, which soon weakens the animal and may cause its death.

The life-cycle is as describe above. The infection thus occurs only in wet places inhabited by water snails. As a rule this parasite gives trouble during the months of May to July after a wet summer when the water has collected in pools which then become sources of infection.

Remedial Measures.—No effective remedy is known as yet, but promising results have been obtained with " tetram ". The administering of any dose containing arsenic is a risky matter, since the small intestine is severely affected so that poisoning can easily occur.

Remove the animals from camps in which there are water pools and kill the snails by adding blue vitriol to the water, as described in the case of liverfluke.

Bilharzia Worm.

The bilharzia worm (*Schistosomum*) (Fig. 4) of sheep, goats and cattle has a habit very similar to that of the species which occur in human beings. It deposits its eggs, however, in the walls of the intestine, whereas the species occurring in man deposits its eggs in the wall of the bladder.

In the *Schistosomum* the males and females are separate. (Most other fluke-worms and the tapeworms are hermaphrodite, i.e. each worm possesses both the male and female sexual organs.) The male *Schistosomum* is narrow, about ⅜ inch long, and of a whitish colour,

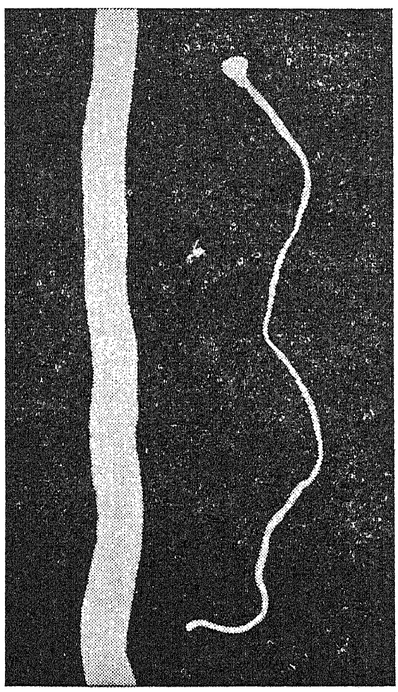


Fig. 7.—Liver tapeworm; enlarged.

while the female is longer and thinner and of a darker colour. The sides of the body of the male are curved inwards, forming a sort of groove which houses the female. The worms live in the veins of the small and large intestines of sheep, goats and cattle.

If an infected sheep were killed and cut open and part of the small intestine lifted without cutting it loose, a close examination would reveal the worms in the veins of the membrane next to the intestine (Fig. 5). The worms periodically crawl up to the intestine and lay

their eggs in the veins of the intestinal wall. The eggs have sharp points and, as a result of the intestinal movements, they are gradually pushed through the wall of the intestine until they are inside, when they are passed out in the excrement of the animal. These worms cause more or less the same disease as does the liverfluke, the lungs and liver in most cases being of a dark-grey colour.

The life-cycle is as described above. The young worms which emerge from the snail swim about in the water and may either burrow through the skin of the sheep or, when they are swallowed, through the walls of the mouth, stomach or intestines. In any case, they enter the bloodstream, and thus reach their destination in the body of the animal.

Remedial measures are, generally, the same as in the case of the liverfluke. Carbon tetrachloride is not effective in this instance. Inoculations may be given, but this should be done by a veterinarian.

II. Tapeworms (*Cestoda*).

Tapeworms are usually long and flat, like narrow ribbons, and have numerous segments (Fig. 6), which may be either large and well-defined or small and indistinct. The head of the worm, which is small, is equipped with suckers and sometimes with hooks which enable it to cling to the intestine. The point where the segments originate is behind the head; therefore the anterior segments are the younger and smaller, while the posterior segments are the older and larger. Each segment contains one or two sets of male and female sexual organs, which produce eggs that are retained in the segment. The terminal segments of the worm are full of eggs, and these constantly break off and pass out in the animal's faeces, while the worm continually forms new segments. The tapeworm has no mouth or entrails; it absorbs into its system, throughout its whole body, the contents of the intestine in which it is lying.

Life-cycle.—The eggs of the tapeworm do not hatch on the veld, but only when they are swallowed by an animal. The young worms then enter the bloodstream and reach various parts of the body, where they develop and form small cysts or bladders containing one or more tapeworm heads; these are termed bladderworms, and may be either small or large. The bladderworm does not, as such, develop further. After being swallowed by another suitable animal it develops into the adult tapeworm. To complete its life-cycle every tapeworm therefore requires two types of animal. We have, for example, the well-known measles in pigs, which constitute the bladderworm form of tapeworm in human beings. Thus, when a person eats pork or bacon containing live measles, the measle bladder is digested and the head of the tapeworm adheres to the intestine and forms segments until it becomes a long worm, while the pig becomes infected through eating the tapeworm eggs discharged by the human being. The life histories of all tapeworms, and their bladderworms, are similar to this.

A. Adult Tapeworms in Sheep.

(1) The Milkworm (*Moniezia expansa*) (Fig. 6) is a large tapeworm which grows to a length of 15 feet, with a width of half an inch. It lives in the small intestine and occurs chiefly in lambs, kids and calves which still suckle.

Infected lambs do not thrive; they become weak and pot-bellied. Worm segments, resembling rice grains, are passed out in the faeces of the lamb; sometimes several segments are linked together.

Life-cycle.—The eggs of the tapeworm are ingested by minute mites which inhabit moist grass. In about two months the eggs in the mites develop into small bladderworms, and animals which happen to ingest these mites are again infected. The habit of lambs and calves to lick grass and any other object promotes infection. The tapeworm in a lamb or calf reaches the adult stage in about 6 weeks' time.

Remedial measures.—For treatment, nodular worm remedy, a solution of blue vitriol and nicotine and tetram are recommended. It is most desirable to use 2 remedies in turn and to apply the treatment regularly every 3 to 4 weeks. In the case of severe infestation, it is desirable to treat lambs and calves from their third week until they are weaned.

The mites which convey the infection cannot stand drought or concentrated sunlight and consequently are only to be found in moist

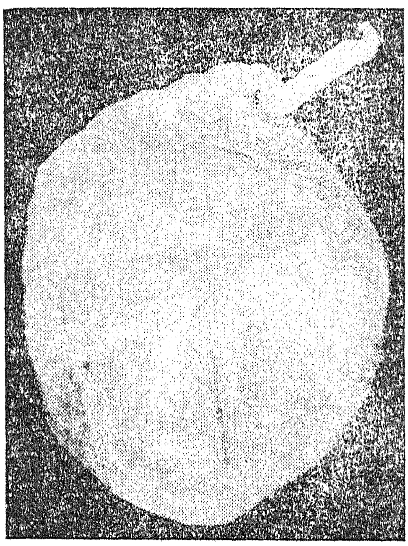


FIG. 8.—Long-necked bladderworm.

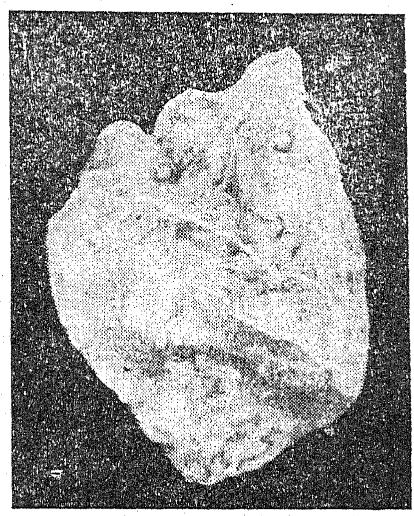


FIG. 9.—Gid bladderworm.

and particularly long grass, and probably also in kraals containing much manure. Consequently moist, long grass should be avoided and calves should not be kept in pens but rather in suitable camps.

(2) The narrow tapeworm (*Avitellina centripunctata*) is less than $\frac{1}{4}$ inch wide, and its segments are so small that they are barely visible to the naked eye. This worm also lives in the small intestine of sheep, goats and cattle. It is not as injurious as the milkworm and its life-cycle, also, is not known.

Remedial measures, where necessary, are the same as for milkworm.

(3) The liver tapeworm (*Stilesia hepatica*) (Fig. 7) is a small tapeworm found in the bile-ducts of the liver of sheep, goats, cattle and game (buck). They are prevalent in South Africa.

These worms are harmless. Their life-cycle is unknown and there is no known remedy against them.

B. Bladderworms Occurring in Sheep, Goats and Cattle.

We are now concerned with tapeworms of the dog and jackal, the bladderworm forms of which live in domestic animals. The tapeworm segments, full of eggs, are deposited on the veld in the excreta of the dog and are there swallowed, with grass, by animals. The eggs hatch in the stomach and intestines of the sheep, the worms enter the bloodstream and so reach the various parts of the body, where they become bladderworms. When a dog eats the bladderworms, the latter in due course become tapeworms.

(i) The long-necked bladderworm (*Cysticercus tenuicollis*) (Fig. 8) is well-known. It occurs in the form of a watery bladder, the size, approximately, of a hen's egg, and is often found between the entrails of sheep. It occurs also in goats, cattle, pigs and game (buck).

When a sheep becomes infected, the worms enter the liver via the bloodstream and then burrow through the liver into the abdominal cavity, where they develop.

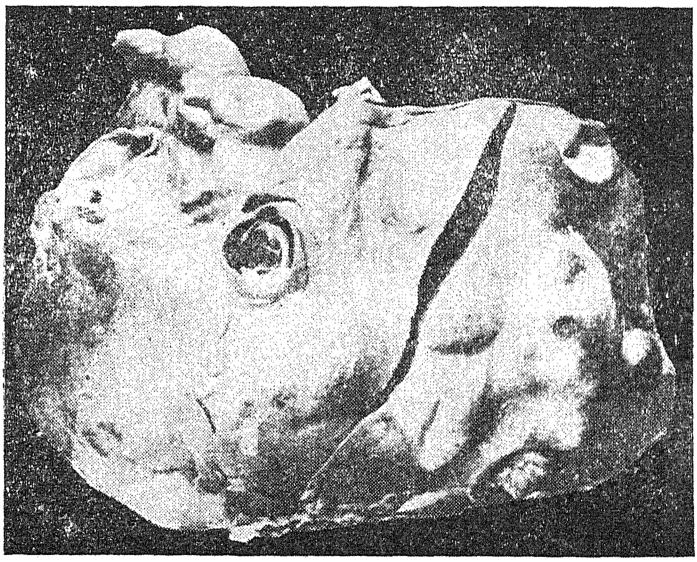


Fig. 10.—Liver with *Echinococcus* bladderworms; reduced.

The adult bladderworm is not injurious, but when an animal is heavily infected, the young worms may injure the liver to such an extent as to cause the death of the animal. The liver is then intersected by red and grey stripes about $\frac{1}{8}$ inch wide, and when the liver is cut these stripes can be seen running right through it, marking the course burrowed by the worms. In most cases, young bladderworms, about $\frac{1}{8}$ inch long and resembling young cucumber seeds, may still be found in these tunnels.

Remedial measures.—Infected animals cannot be treated, but infection can be avoided by freeing all the farm dogs from tapeworm and keeping away all stray dogs. Jackals also harbour the same tapeworm as dogs—another reason why they should be destroyed. Treat the dogs as follows every 3 months and see that nothing containing the bladderworm of the sheep is given them to eat. Give the dog the evening prior to treatment a dose of oil so that it may not be costive when the remedy is administered. Dose it four hours after feeding with an A--coline hydrobromide pill of $\frac{1}{2}$ grain dissolved in 4 dessert-

[Continued on page 732.

The Farm Home.

(A Section devoted mainly to the interests of Farm Women.)

The Decoration of Cakes.

Miss N. Hattingh, Home Economics Officer, Department of Agriculture and Forestry.

THE decoration of cakes requires time and practice to be successful. For the decoration of ordinary cakes, soft icing is used and not much time is required. Moreover, the process is an easy and quick one. But, for the decoration of special cakes, such as wedding

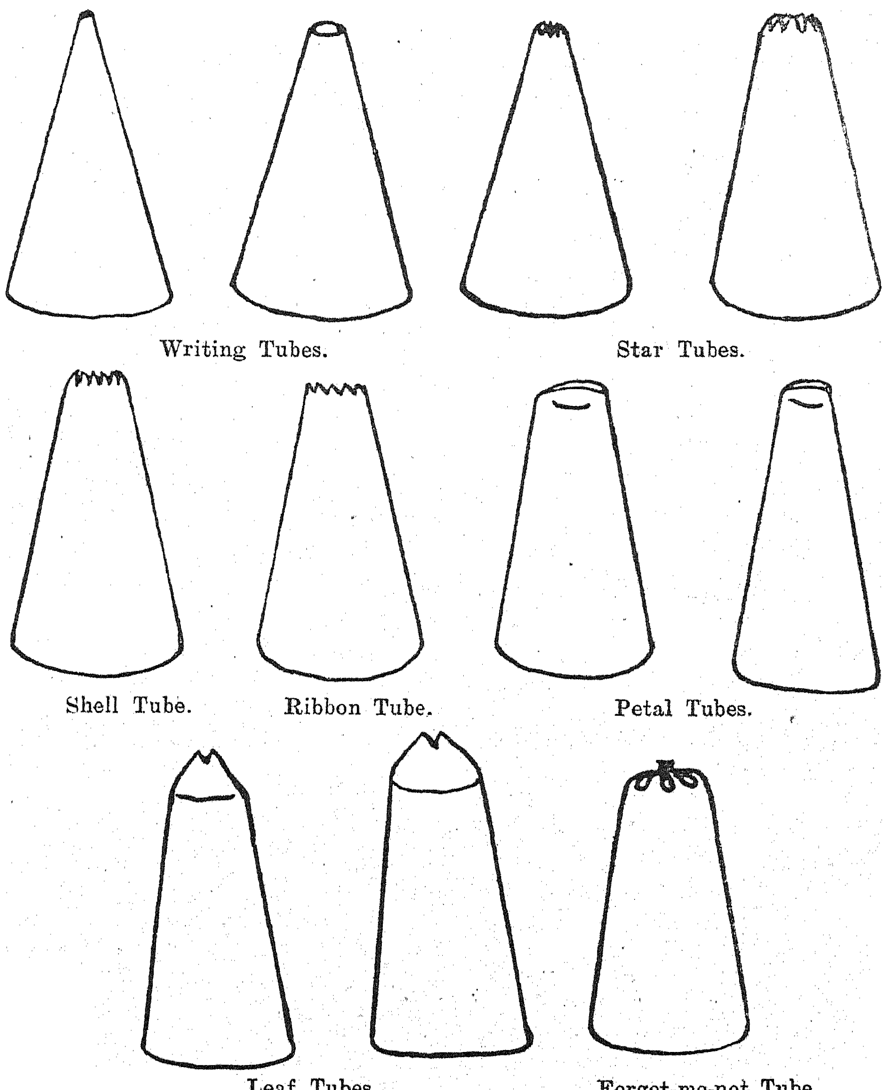


FIG. I.

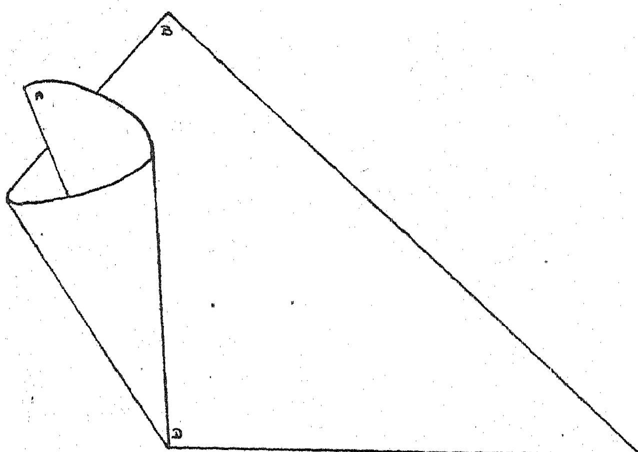
birthday and rich fruit cakes, a hard icing is used. In order to make a real success of this type of decoration, only the best ingredients should be used. For such decorations a number of utensils is required, a brief description of which is given below.

Utensils.

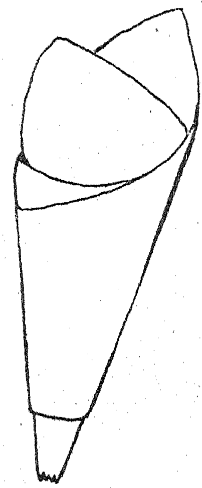
1. *Icing Tubes* are a first requirement and care should be taken to obtain the correct type.

The tubes should be of a good, hard but light metal. Soft metal tubes bend easily and will soon lose shape. Each tube should be clear cut and well finished. A set of eleven, including the various shapes shown in Fig. I will be sufficient.

It is not essential to buy tubes since paper bags can be cut to the required shape, but decoration tubes are not expensive and last a lifetime.



Folding of triangle.



Paper bag with tube ready for closing.

FIG. II.

Clean the tubes well after use, for the icing sugar may become very hard if not washed off immediately and the delicate edges of the tubes may bend if cleaning is postponed.

2. *Paper Bags.*—For these a strong, thin, pliable butter or waxed paper is used. It is of the utmost importance that the bags are folded in the correct way to facilitate the work. Cut a square piece of paper with sides measuring approximately 12 inches; then cut diagonally so that two triangles are formed.

Method of Folding.—(1) Take the triangular piece of paper in the left hand (Fig. II); (2) place the thumb on A and the third finger in the direction of the longest side of the triangle; (3) fold point A over on to B, forming a conical bag; (4) now with the right hand twist the bag so that a sharp point is formed at D; and (5) hold the bag carefully so that the paper does not move, and with a pair of scissors cut off the point so that about half the tube protrudes.

To fill an icing bag neatly, the icing sugar should be put in with a spoon; shake the spoon gently so that the icing sugar drops right to the bottom of the bag, the edges of the bag remain clean

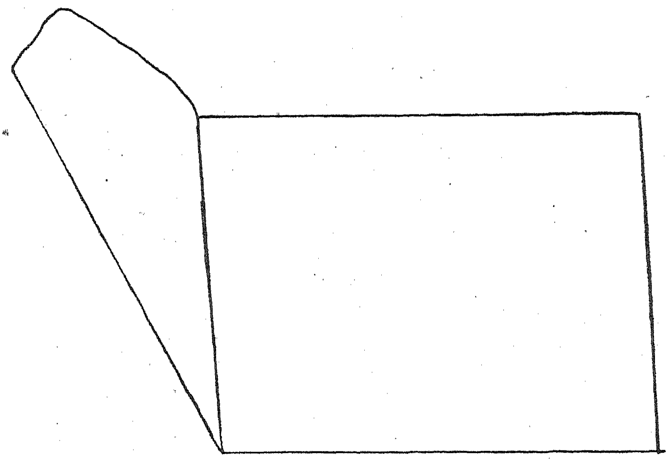


Fig. II (a).—Folding a bag from a rectangular piece of paper.

and no sugar oozes out when the bag is closed. Press the upper part of the bag together, push the sugar down and fold over the third of one side, then one third of the other side and finally the whole as illustrated in Fig. III.

Instead of using a triangular piece of paper for folding the bag, a rectangular piece can be used with sides measuring 12 in. and 16 in. respectively (Fig. II a). This gives a much stronger bag which can be used over and over again without breaking.

An icing tube can also be used, but it is better to make use of a paper bag since a great deal of force is required and the fingers become fatigued when the tube is handled and the icing does not come out evenly.

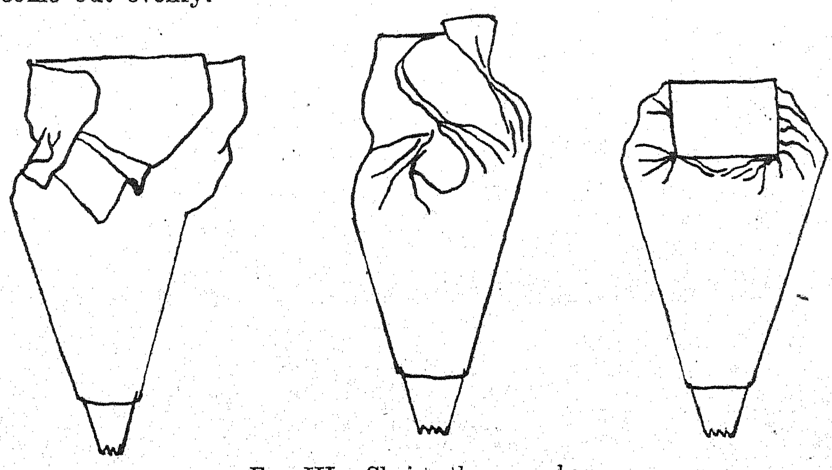


Fig. III.—Closing the paper bag.

A rubber bag with a double screw-cap is also very handy (Fig. IV), the advantage being that only one bag is required and various tubes can be screwed on in turn.

Instead of a rubber bag, bags made of linen or other material can be used, but of these quite a number will be required. Paper bags will, therefore, be more economical.

During the icing process the bag is held so that the thumb rests near the top folds. It is then manipulated with the thumb and two fingers of the right hand and supported with the left hand. Hold the bags as lightly as you would hold a pen.

3. *A Revolving Stand.*—When the cake is being iced, it is placed on a revolving stand to facilitate the work. The cake remains in one position throughout and is not damaged by being pushed about. A wooden stand is best because it is light; the type illustrated in Fig. V will last a long time. The surface on which

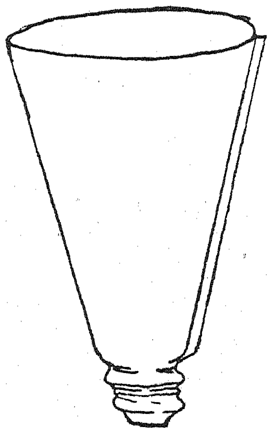


FIG. IV.—A rubber bag.

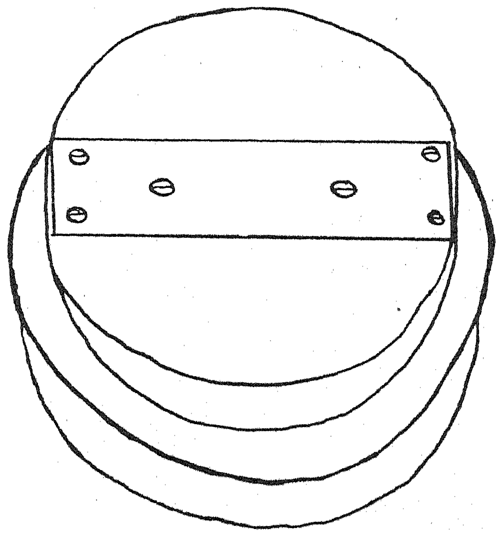


FIG. V.—Revolving stand.

the cake rests must be sufficiently large so that no pieces break off when the cake is moved. The stand is not indispensable however. Before the cake is placed on the stand a hard cardboard base, $\frac{1}{2}$ in. to 1 in. wider than the bottom surface of the cake, is placed on the stand. Inexpensive hard cardboard can be bought for the purpose. The cake is then placed on the cardboard and the icing can begin.

4. *Spatula.*—The spatula used for icing cakes must be broad and flexible. A spatula which is either too flexible or too rigid makes the work more difficult.

5. *Icing Sugar.*—Use the best quality icing sugar for hard icing. An inferior quality makes the work more difficult and the finished product will not be satisfactory. Always sift the icing sugar and roll out the lumps with a rolling pin.

When mixing the icing sugar, a few drops of *washing-blue* solution are added before the sugar is beaten up in order that the colour will work in well and no blue streaks are formed. The purpose of the blue is to whiten the icing. The colour should be white throughout.

Further, 3 drops of *acetic acid* (undiluted) are added to each white of an egg used. Do not add too much acetic acid as this renders the icing porous and frothy, in which state it is unsuitable for fine trellis work. Acetic acid is added because it makes the

icing sugar elastic and pliable yet firm, and enables it to retain its shape. It also gives the icing sugar a snowy colour.

Lemon juice cannot be used since it softens the icing sugar and tends to make it yellow. Avoid flavouring essences as these contain oil which will prevent the icing sugar from becoming firm and hard. Sometimes *glycerine* is added in order to prevent the layer of icing sugar on the cake becoming too hard; ½ t. of glycerine is added to every ½ c. of whites.

6. *Colouring.*—Vegetable colouring matter is the best to use. Avoid bright colours since they give the cake an unattractive appearance. Soft pastel shades are very attractive. Various colours can be obtained by mixing the three basic colours, red, blue and yellow. Red and blue make mauve; blue and yellow make green; red and yellow make orange and purple and green make olive green.

Colouring can be obtained at any chemist's in the form of a powder. Mix it with water and use small quantities.

7. *Bowls.*—Use enamel, earthenware or porcelain mixing bowls. No. chipped enamel bowls should be used, as the iron will taint the icing sugar yellow.

8. *Cover.*—During the icing process the mixing bowl should be kept covered with a damp cloth. This keeps the icing sugar soft and prevents the formation of a hard crust.

Soft Icing.

The cake should be cold before icing is commenced, otherwise it will become doughy. Remove all loose crumbs as they may perhaps mix with the icing, thus spoiling the appearance of the cake. Soft icing is also sometimes used as a filling. As it is not practical to spend too much time on the icing, we shall use a simple design which is quick and easy to make.

Soft icing is made by mixing icing sugar with a sufficient quantity of hot water to give it the required consistency. Instead of water any other suitable liquid, such as fruit juice, or coffee extract, may be used. Butter may also be substituted for part of the liquid.

(1) *Coffee Icing.*—Make a water icing and add sufficient coffee extract to obtain the colour desired.

(2) *Butter Icing.*—Cream ¼ lb. butter and 6 ounces of icing sugar. Add sufficient flavouring and colouring, if desired, and decorate with ground coconut slightly browned in a cool oven, or with crystallized cherries. This icing is suitable for simple decoration with tubes.

(3) *Boiled Icing* (7 minutes).—Use the white of one egg (unbeaten), ⅞ c. sugar (sifted), 2 T. cold water, ¼ t. cream of tartar and ⅛ t. salt.

Place these ingredients in the top section of a double boiler, stir until sugar has melted and beat quickly over hot water until the mixture forms little spikes (7-10 minutes).

(4) *Boiled Icing* (White Mountain).—Use 1 c. sugar, ⅓ c. boiling water, the white of one egg, 1 t. vanilla essence and ⅛ t. cream of tartar.

(i) Put the sugar and water into a saucepan and stir. Wash sides of saucepan to prevent sugar from adhering to it.

(ii) Bring slowly to the boil and add cream of tartar.

(iii) Continue boiling until soft ball stage is reached or until stringy.

(iv) Slowly pour syrup on to well-beaten egg whites and continue beating until the icing has the required consistency for spreading.

(v) For icing use a knife dipped in warm water. Various flavourings can be added, such as maraschino-cherries and sauce, melted chocolate or 1 t. coffee extract.

(5) *Grenadilla Glacé Icing.*—Use ½ lb. icing sugar and 2 T. grenadilla juice. (1) Put sugar and juice in a mixing bowl, (2) heat over warm water. Do not overheat otherwise the icing loses its gloss, and (3) spread over cake.

(6) *Mocha Icing.*— Use ⅔ c. butter, 2½ c. icing sugar, 1 egg yolk, coffee extract and 1 t. vanilla.

(1) Cream the butter, (2) add beaten egg yolk and gradually the sugar, and (3) add vanilla and coffee extract.

(7) *Chocolate Icing.*—Use 2 squares grated chocolate, 1 t. butter, 4 T. hot water and ¼ t. vanilla. (1) Melt chocolate over hot water, (2) add butter and hot water, (3) cool and add sufficient icing sugar to form an icing of the required consistency, and (4) add vanilla.

If cocoa is used instead of chocolate, it should be boiled for 2 minutes in order to convert the starch in the cocoa. For this recipe 1 T. cocoa is the equivalent of 1 sqare of chocolate.

Butter cakes can further be decorated with a ready-coloured coconut. Otherwise the coconut can be coloured as follows: dissolve some colouring matter in water, rub the coconut in well and allow to dry. Roasted nuts or coconut, glazed cherries, sugared peel or any fresh or canned fruit can also be used to decorate cakes.

(8) *Fondant Icing.*—A fondant mixture can also be used to decorate cakes. It forms a smooth coating. Any colouring or flavouring can be added, and fruit or nuts can be used to give the finishing touches.

Use 1c. sugar, ¼ c. cold water and ⅛ t. cream of tartar dissolved in ½ t. water.

(1) Put the sugar and water in a saucepan and stir until the sugar has melted, (2) add the cream of tartar; wash down the sides of the saucepan with a brush dipped in cold water to remove any sugar grains, and (3) boil rapidly until mixture forms a soft ball in cold water, or until temperature registers 238° F. (at sea-level).

The syrup should be stringy. As soon as the mixture boils it should no longer be stirred, otherwise crystallization will take place; (4) wet a marble slab or flat-bottomed tray with cold water; (5) pour the syrup gently on to the marble slab (do not scrape out the saucepan); (6) when syrup has cooled somewhat, turn the mixture towards the centre with a spatula or wooden spoon until it is cold enough for kneading; (7) knead until creamy and perfectly smooth; (8) cut in pieces and leave for 2-3 days to mature before using. Fondant may be kept in a jar for months.

For use, melt the fondant over hot water and then pour it over the cake. Add the desired colouring and flavouring. For decoration purposes fondant can be used in the same way as butter icing by working in a piece of butter in the fondant before melting it in order to render it pliable.

Dipping of Cookies in Fondant.—Put the fondant in a small mixing bowl, add the desired flavouring and colouring and melt over hot water. Preferably use delicate shades. Dip the cookie into the melted fondant and take out immediately. Put on a cake cooler and garnish with nuts, cherries or fruit. Before the cookie is dipped into the fondant, it should be brushed over with apricot syrup or the beaten white of an egg. If a glossy finish is preferred, place the dipped cookies in a cool oven for a few minutes.

Any of the icings can be used on butter cakes. Simple designs can be made and light, soft shades should be chosen.

Hard Icings.

Hard icing requires more practice and time than soft icing. Hard icing is only used for wedding, birthday and rich fruit cakes. Before the cake is iced, it should be left to mature a few days or even from 2-3 weeks if it is very rich. The cake should be well cooled before being placed in a bin to ripen. Keep it in a cool, dry place. Decorate the cake shortly before use, otherwise the icing becomes very hard and the cake will be hard to cut. To get a smooth, even surface, the cake should be levelled by cutting a piece off the top; it is then turned upside down.

Before the cake is iced, it is customary first to cover it with an almond layer, the purpose of which is—

(1) to prevent crumbs from mixing with the icing sugar;
(2) to prevent discolouration of the icing sugar as a result of the ripening of the cake;
(3) to give a smooth surface for easy icing;
(4) to give extra richness and flavour to the cake.

Almond Paste I.—Use 1 lb. almonds (ground); ½ lb. icing sugar; ½ lb. castor sugar; the yolks of about 8 eggs, and 1 t. vanilla essence, brandy or liqueur.

Almond Paste II.—Use 1 lb. ground almonds; 2 lb. icing sugar and the whites of eggs or sufficient whole eggs.

The method of mixing is the same for all recipes. Always sift the sugar to remove lumps.

(1) Mix the ground almonds with the sugar; (2) work in sufficient whole eggs, yolks or whites, to make a stiff paste easy to roll out, and (3) add flavouring and knead well.

If so desired, the almonds and the sugar can be slightly heated before the eggs are added. This gives a more pliable mixture.

Boiled Almond Paste.—Another way of preparing almond paste is to boil the sugar to a thick syrup and then to add the ground almonds.

(1) Put 1 lb. sugar and ½ c. water in a saucepan and stir until melted; (2) as soon as it boils, add ⅛ t. cream of tartar mixed with ½ t. water and stir; (3) allow the syrup to boil without stirring until it forms a soft ball when dropped into cold water; (4) add the almonds and knead on a surface sprinkled with icing sugar until smooth.

The paste made in this way is not as soft as the others, but the method is valuable when eggs are scarce.

The almond paste is put on the cake as follows: (1) Carefully brush off all the crumbs; (2) then brush over the entire surface to be covered with the almond layer with the white of an egg or thin jam. The almond paste itself can also be brushed over with some yolk. If the jam is too thick, it should be heated and enough water added. Divide the paste into 2 portions, using the larger portion for the sides and the smaller for the top. (3) Roll out the almond paste to the desired thickness, i.e. from ⅛ in. to ¼ in. Sprinkle some icing sugar on the board and dust the rolling pin with it. Any dents in the cake can be filled up with almond paste. (4) Now place the rolled out almond paste on the cake's round surface, and (5) carefully cut off the sides. (6) Roll out 2 long pieces—as long as the circumference of the cake—and (7) cut out 2 rectangular pieces. Lift the one carefully and place against the cake. Repeat with the other piece. (8) Press the almond layer tightly against the cake and take care that sharp edges are formed. (9) After the almond layer has been put on, it should be allowed to dry thoroughly, or it should be dried in a cool oven.

Hard Icing.—If desired, a water icing or melted fondant flavoured with rosewater may be used as the first layer. This will not only render the cake easier to cut, softer and give it a pleasanter taste, but it will also prevent the richness of the cake from penetrating. Hard icing is not as pleasant to the taste as soft icing, of course.

After the first layer has been put on, it should be allowed to dry thoroughly. When dry, a layer of hard icing is put over it. If desired, another layer may be put on. Place a sufficient quantity of the mixture in the centre of the top surface of the cake and spread it out with a spatula. Dip the spatula in cold water to facilitate the work. To get the icing on very smoothly requires a great deal of practice. Every layer should be thoroughly dry before the next layer is applied.

A good method to put on a third layer is to make the hard icing thinner by adding water to it and then pouring it over the cake so that it is evenly covered. It is then smoothed out with a spatula. This surface will have a beautiful gloss and will be very smooth.

Hard icing consists of icing sugar, smoothly mixed with the unbeaten whites of eggs, a few drops of acetic acid and a few drops of washing-blue solution.

Method of Mixing.—The first and most important step is to sift the icing sugar in order to remove any lumps, thus facilitating the work as much as possible. If it contains many lumps, these should be pulverized with a rolling pin before sifting. Only the best icing sugar should be used.

Put the egg whites in a mixing bowl and gently beat in a sufficient quantity of icing sugar to form a mixture that can be easily spread. It is best to have the mixture somewhat on the soft side since continuous beating will bring it to the correct consistency. The number of eggs required depends on the size of the cake, but 2 whites are usually sufficient for every pound of icing sugar. Now add the acetic acid and the blue and beat thoroughly for 15 to 20 minutes until the icing sugar is light and pliable and keeps its shape well. Test the thickness by lifting the spoon. The point thus formed by the icing sugar should keep its shape and not bend over.

Good, thorough beating is of great importance since it facilitates the work and gives a satisfactory result. Icing sugar for the layers need not be as thick as that used for the decoration and can be made thinner with water.

The icing sugar intended for the decorations should be thoroughly stirred every now and then.

It is best to use the whites of new-laid eggs especially if hard icing is used for the decoration.

Designs.

Before the decoration is begun, a suitable design should be chosen. The cake's surface is divided into from 4 to 6 or 8 equal parts. All lines and curves should be in the correct geometrical position. An over-decorated cake is unattractive. It is not always the profusely decorated cake which looks best. An easy method to get the parts equal is as follows: Take a pice of paper, cut it to the size of the cake's surface, fold it double and double again, whereby 4 equal parts are obtained. Fold it double once more, when 8 equal parts will be formed. Place the paper on the cake and mark off all the points with a pin. After the design has been marked on the cake like this, it can be sketched with the writing tube.

It would be as well to sketch the design on the paper and then mark it off on the cake with a pin. Do the same with the sides of

the cake. This method not only facilitates the work but also ensures accuracy. Nothing is more unattractive than irregular, unsteady lines.

Practice in Making Designs.—Before the novice ventures to decorate a cake, she should first practise on a piece of cardboard or the back of a pan. First try and make straight lines, curves, small circles, waves, simple letters, etc., with a writing tube.

Such practice forms the foundation of successful decoration. Some of the designs can also be made with the star tube.

It would be worth while always to have a good look at the designs on cakes in bakers' shops.

A few simple designs are given here. Practice facilitates the work and makes for skill.

A design may be simple but if accurately and neatly done it always looks attarctive.

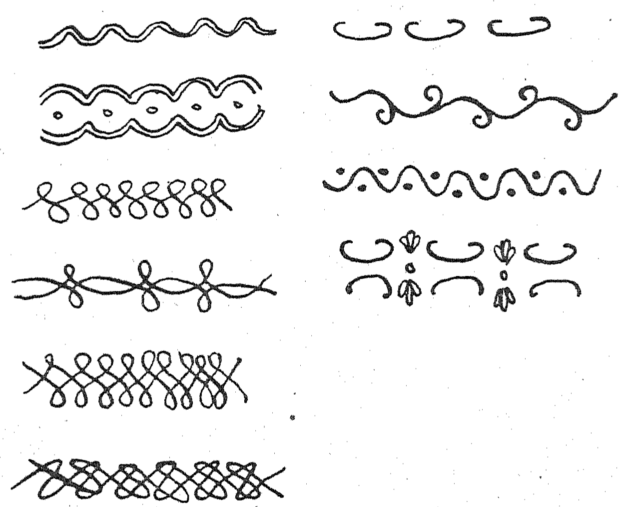


FIG. VI.—Simple lace designs.

Writing with Icing Sugar.—It will be best to sketch the inscription with a large writing tube before starting. See that all the letters are of the same size. As soon as the icing sugar has dried slightly, trace the lines with a smaller tube and then with a fine writing tube. Take care to keep on the original lines.

For Xmas and birthday cakes it is very effective to use a delicate colour, such as a light pink, for example. When the letter "T" is made, make the cross stroke at an angle so as to get the spaces regular.

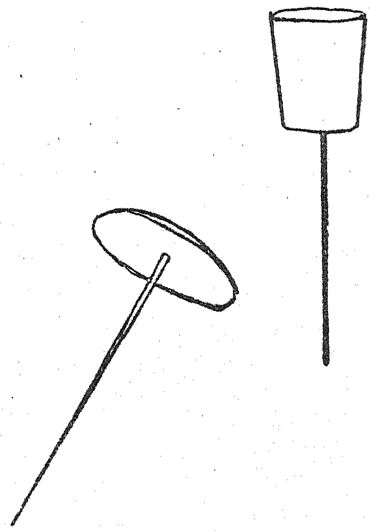
The Making of Flowers.—Most flowers are easy to make, and with a little practice, skill and handiness are acquired. For the making of flowers, rose nails are used. A good idea is to take a cork stopper and to insert a stiff piece of wire in the bottom.

When making flowers, the colour should always be kept in mind. Follow nature as far as possible and remember that bright and vivid colours are unattractive.

The Making of Roses.—Take a rose nail and put a small piece of icing sugar on it; then fix on a small square piece of paper, slightly buttered, to prevent the rose from adhering to the nail. Use

fairly stiff icing sugar and with a petal tube shape the centre of the rose by turning the tube so that the top end is nearly closed. Now make the next three petals and let them dry. Make three more petals and continue in this way until the rose is finished. Remove the paper and allow the rose to dry.

To make rose buds a petal tube should be used and a bud is shaped in the same way as the centre. Any other kind of flower can be made by copying the natural shape as far as possible. Sweetpeas can be made by putting a few different shades of icing sugar in one and the same paper bag.



Rose nail. Cork stopper with wire.
FIG. VII.

Cake Ornaments and Gum-paste Decorations.

Many types of decorations can be made of gum paste. To make gum paste, use 2 ounces gum "dragon" powdered starch, icing sugar and washing-blue.

Use the best gum which ought to be snow-white. Place the gum in a basin of water and leave for 24 hours, after which it will be soft and pliable.

Take the gum out of the water, place it in a piece of material and squeeze out as much of the moisture as possible. Now work into the gum a mixture of 3 parts icing sugar to one part starch until the gum will absorb no more of the mixture. Add some blue and work until a clear, smooth paste results.

This paste can be used for any kind of decoration. Gum ornaments must be quite dry before they are placed on the cake. Roll out the gum paste as thinly as possible. Mix some gum paste with icing sugar which makes it pliable.

The shape, etc., of flowers and fruit as they occur in nature, should be copied a closely as possible.

The Making of a Rose.—Follow the recipe for almond paste II. Take a lump of almond paste, roll it lightly to make the sides smooth. Press it in the palm of the left hand and shape a small rose petal. Gradually increase the size of the petals and fit them together. The petals should not be too regular in shape and not too stiffly pressed together.

The Making of Leaves.—Roll the almond paste out thinly on a board dusted with icing sugar. Press a real leaf onto this to mark the veins and cut out the shape with a knife. Allow to dry.

Fruits.—Shape the desired fruits or berries with the hand. As soon as the flowers and fruits are dry they can be fixed onto the cake with a little icing.

Trellis Work.

Trellis work can be built up on the cake itself, or loose trellis ornaments can be made on trellis work pegs or on buttered paper and fixed on to the cake with some icing when dry.

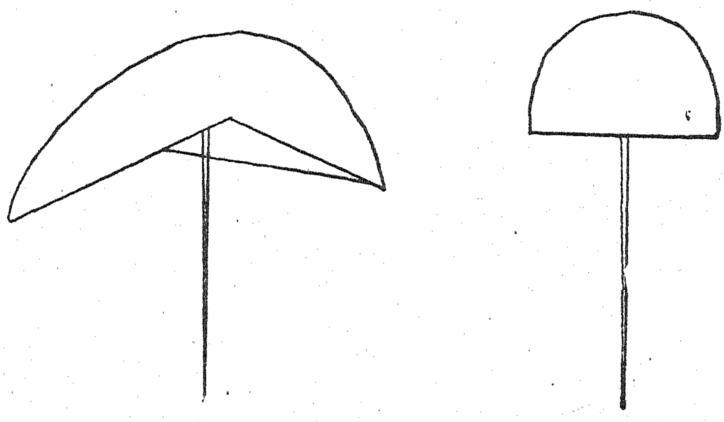


FIG. VIII.—Trellis pegs to make ornaments.

Trellis work is usually made with the aid of a fine writing tube. Draw the design on a piece of paper, turn round, brush with butter and then work on this. There must be sufficient cross bars to keep the ornament together. Remove the ornament from the paper when dry and repeat the lines in the back in order that the design will be the same on either side. These decorations can also be made on netting. Fix the decorations with some icing.

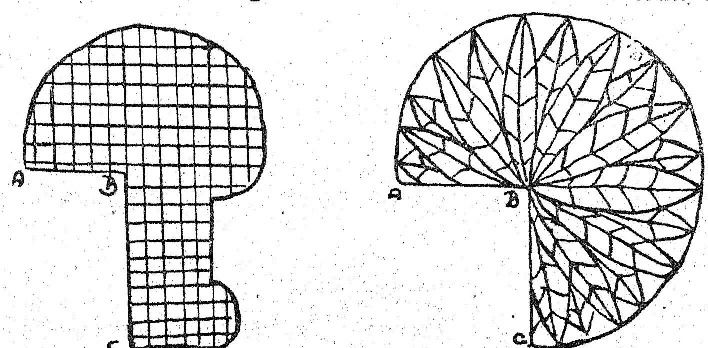


FIG. IX.—At A, B and C the icing is fixed on to the cake.

Ornaments can also be made with the writing tube over bottles or tumblers, which should first be brushed with butter.

The decoration of wedding cakes requires more time and attention than that of birthday or Xmas cakes, and to make a success

of cake decorations requires time; attention and a great deal of practice.

To obtain a pretty effect we should always choose delicate pastel shades on a beautiful white surface.

LITERATURE.

Cake Making and Icing of Cakes.—Jeanette C. v. Duyn.
Cake Decoration.—Ernest Schulbe.

Worms in Sheep, Goats and Cattle:—

[*Continued from page* 720.

spoonfuls of water, so that a dessertspoonful shall contain $\frac{1}{8}$ grain. Tilt the dog's head backward, pull out the cheek on one side, pour in the medicine, $^{1}/_{16}$ to $\frac{1}{2}$ grain, according to the size of the dog (the dose for an adult fox-terrier is $\frac{1}{4}$ grain and for a pointer, $\frac{1}{2}$ grain). The dog should be kept tied up until it has passed the tapeworms, which should thereupon be burnt. The dose usually acts within half an hour.

(2) The gid bladderworm (*Multiceps*) (Fig. 9) grows as large as a hen's egg and is a thin bladder containing a clear liquid and a number of tapeworm heads. It occurs in the cranial cavity, usually at the back of the brain; sometimes also in the spinal column in sheep, goats and cattle. When an animal becomes infected, the young worms enter the brain via the bloodstream and develop there. When a dog eats the bladderworm it becomes infected with tapeworm.

In the beginning the sheep does not show signs of infection. Later, after 5 to 7 months, when the bladderworm has grown large and presses on the brain, typical symptoms of the disease appear. The sheep holds its head upward and backward and stumbles in its walk. It usually ceases feeding and mostly dies within a few days. The disease should not be confused with heart-water, which shows similar symptoms but is accompanied by high temperatures.

Remedial measures.—In the case of valuable sheep, an operation for the removal of the bladderworms could be done, but in most cases the trouble and expense of an operation would not be justified. Infection can be prevented by treating, in the above-described manner, the dogs carrying the tapeworm and by exterminating the jackal. Since a period of 7 months may elapse from the time of infection until the disease manifests itselfs, it is possible that new cases may occur a few months after remedial measures have been taken.

(3) The *Echinococcus* bladderworm (Fig. 10) is also a large form of bladderworm of a tapeworm of dogs. The sheep is not the only animal infected but all other domestic animals and also human beings. The bladderworms usually occur in the liver and lungs, but also in other parts of the body. In sheep and other animals, it occurs in the form of a large cyst and does not do much harm, but in the human being the cyst usually forms buds which in turn become cysts or bladders, so that in course of time a large and dangerous growth is caused by the parasite.

The only important point in connection with this type of worm infection in sheep is that dogs can become infected from them, and thus they also constitute a source of infection for human beings. The bladderworms should, therefore, not be fed to dogs, which should be regularly treated as already described.

[In a following article the Round or Wireworms (Nematoda) **will be dealt with.**]

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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Price Review for September 1944.*

Citrus and tropical fruit—moderate offerings.—Fairly large consignments of oranges arrived on the markets and sold well as a result of a good demand. Lemons and naartjies were offered in moderate quantities, while grapefruit, which were scarcer, enjoyed a brisk demand. Papaws in general were plentiful. Supplies of papaws, however, decreased towards the end of the month on the Johannesburg market, and prices increased. Avocados, granadillas, guavas and pineapples were, in general, offered in small quantities. The demand for pineapples and granadillas in particular was good, and prices exceptionally high. On the Cape Town market, for instance, the price of pineapples increased from 8s. to 15s. 4d. per box, and from 4s. 5d. to 5s. 9d. per dozen for ordinary qualities on the Johannesburg market. Moderate quantities of apples sold at unchanged prices as a result of an unsatisfactory demand.

Tomatoes well supplied—prices somewhat lower.—Large supplies of tomatoes were offered during the past month on most markets. On the Johannesburg market the supply was good, especially during the first half of the month, and prices were low. During the second half of the month supplies decreased, and favourable prices were realized.

Onions—supplies small, prices higher.—Limited quantities of onions were offered on most markets. Average prices on all markets showed a considerable increase for the month in comparison with those of the previous month. On the Johannesburg market, for instance, locally produced onions increased in price from 14s. 2d. to 23s. 3d. per bag of 120 lb., while Cape onions increased from 21s. 7d. to 27s. 10d. On the Durban market a firm demand was experienced for good dry onions, and prices as high as 33s. 11d. per 120 lb. bag were realized during the third week.

* All prices mentioned are averages.

Small improvement in the potato position.—The position on the potato market improved somewhat mainly as a result of an improvement in the supply. (For further details see article in this issue).

Vegetables—moderately well supplied.—In general, sufficient supplies of vegetables such as cabbages, cauliflower, carrots, green beans and pumpkins were received. The average monthly prices obtained for most kinds of vegetables on the markets were higher than during the previous month. Prices of cabbages, cauliflower and carrots increased considerably, especially on the Durban market. Prices of green beans decreased as a result of an increase in supply. Green peas were scarce and prices advanced accordingly.

Hay and forage supplied in greater quantities.—The markets were well supplied with hay such as Cape lucerne, teff hay and oats. A strong demand for good qualities was experienced, whereas poor qualities sold less well.

Smaller supplies of kaffircorn, dry beans and dry peas.—The supply of kaffircorn on the Johannesburg market was smaller than during the previous month, and prices showed a small increase. On 29 September, 1944, however, prices of kaffircorn were fixed. (For further particulars see announcement elsewhere in this issue). The supply of dry beans and dry peas decreased and prices increased.

Supplies of poultry and poultry products unchanged.—The average prices for eggs during September showed practically no change as compared with those of the previous month. On the Cape Town market, however, prices for new-laid eggs decreased from 12s. 0d. per 100 to 10s. 8d. The supply of poultry was smaller during September than for August. Prices for turkeys advanced on all markets, whereas prices for fowls decreased.

Index of Prices of Field Crops and Animal Products.

As shown elsewhere in this issue, this index advanced from 163 to 166 in September.

The most important price changes occurred in the following groups:—

(*a*) "Hay" which advanced from 147 to 160 mainly as a result of an increase in the prices of lucerne and teff hay.

(*b*) "Other field-crop products" which advanced from 343 to 393 mainly as a result of an increase in the prices of sweet potatoes and onions.

(*c*) "Slaughter stock" which advanced from 170 to 175 as a result of the increase in the prices of mutton, lamb and goat's meat.

(*d*) "Poultry and Poultry products" which decreased from 160 to 154 as a result of a decrease in prices of eggs on the Cape Town market, and of fowls on the Johannesburg, Cape Town and Durban markets.

Potatoes and Groundnuts.

Potatoes.—The supply position as regards potatoes remains acute and although somewhat larger quantities, particularly from the Transvaal lowveld, arrived on the markets during the past month (September), maximum fixed prices were still maintained.

Where previously a system of rationing to traders was introduced on most markets, further measures were adopted at a few of the larger centres during the month by the Food Controller; who took over all potatoes arriving in those centres and distributed them direct to consumers at the maximum fixed prices of 4 pounds for 1s. 1d. This resulted in the available supplies being more evenly distrubuted amongst consumers. On account of this general scarcity of table potatoes, the danger exists that lowveld potatoes which are normally available for seed, will now all be disposed of as food.

The Department of Agriculture and Forestry therefore took steps to inspect potatolands to determine which lands would be suitable for seed purposes. If these potatoes are allowed to mature, farmers will be able to sell them at £2 per bag free-on-rail. It is expected that, including the seed from the Pongola Settlement, approximately 15,000 bags of seed potatoes will be available for planting in the western Transvaal and middleveld during December and January. Full particulars about this scheme are obtainable from the Director of Animal and Crop Production, Union Buildings, Pretoria.

The maximum producer's and consumer's prices, viz. 33s 6d. and 38s. per bag, respectively, which should have remained effective up to and including 21 October, 1944, will continue to apply until 4 November, 1944. This extension has been granted because of the fact that the present lowveld potato crop is later than usual and farmers accordingly were inclined to start lifting before the potatoes were properly mature in order to take advantage of the favourable maximum prices which should only have been effective up to 21 October, 1944.

Groundnut seed.—In order to ensure an adequate supply of groundnuts for edible and manufacturing purposes, the Department of Agriculture and Forestry has again instituted a groundnut seed loan scheme. This year, however the scheme will be confined to those districts where groundnuts have been grown regularly and where an appreciable increase in production has taken place during the past two years.

For this purpose the " Waterberg Landbouers Koöperatiewe Vereniging " has been asked to prepare seed at its Nylstroom and Potgietersrust dépôts. Only treated seed will be obtainable under the loan scheme, and at 87s. per 200 lb.

Forms for this purpose are obtainable from the Magistrates in the districts concerned, or from the abovementioned co-operative society.

Agricultural Conditions in the Union during September 1944.

Rainfall.—Good timely rains fell in nearly all parts of the country, except parts of the lowveld of Transvaal and parts of the north-western Cape Province. Cold windy weather and untimely frost still occurred.

Livestock.—The condition of livestock was still exceptionally poor but an improvement was in prospect as soon as pastures improved as a result of the rains. In the north-western Cape Province, however, droughty conditions continued. Except for blowfly in the Karroo and cases of redwater and gallsickness in a few districts of the Transvaal and Natal, stock diseases on the whole were still quiet.

Wheat.— A good crop of wheat and other winter cereals is generally expected in the western Cape Province. Prospects in the O.F.S., however, still remain unsatisfactory on account of the damage done by wheat lice. In the Transvaal the early rains caused an improvement in the general prospects of the wheat crop, especially in the western Transvaal.

As a result of rains, farmers could start preparing their lands for the coming summer season. Vegetables in general remained scarce, while untimely frosts and cold winds caused considerable damage to orchards.

Price Control Measures.

Maximum prices of used bags increased.—As announced in *Government Gazette Extraordinary* of 16 September 1944 the maximum prices of used bags have been increased. This price increase represents an advance of about 30 per cent. on the old fixed maximum prices.

Maximum price for farm butter fixed.—As announced in *Government Gazette Extraordinary* of 22 September 1944, a maximum price of farm butter has been fixed, viz., 1s. 11d. per pound. This is the first time that a price control measure has been applied to farm butter.

Further increase in producers' prices of slaughter sheep.—As announced in *Government Gazette Extraordinary* of 22 September 1944, the producer's prices of mutton, lamb and goat's meat have been increased by another ¼d. per pound warm dressed weight as from that date. This price increase was made possible by a further saving originated by narrowing the profit margin of distributors. This together with the ¼d. per pound dressed weight granted on 28 August 1944, therefore means an increase of ½d. per pound dressed weight on producers' prices.

Details concerning the amendment of wholesale prices of meat in controlled areas also appear in the *Government Gazette Extraordinary* of 22 September 1944.

Maximum retail prices of meat in rural areas.—As announced in the previous issue of Crops and Markets, the maximum retail prices of meat in rural areas were decreased on 8 September 1944 by 2d. per pound in the case of mutton and lamb, and 1d. per pound in the case of beef. These prices were, however, again revised and increased by ½d. per pound as from 22 September 1944 (see *Government Gazette Extraordinary* of 22 September 1944).

Fixation of prices of kaffircorn.—As a result of the exceptionally good kaffircorn crops which were reaped during the present and the previous season, prices on the kaffircorn market began to show a falling tendency. Since it was felt that prices of kaffircorn should not fall to a lower level than those of maize, it was decided to fix the producer's price for kaffircorn at 16s. per bag. This price will apply in respect of the grades K1, K2 and K3.

By means of a Government guarantee the Landbank is enabled to grant an advance of 16/- per bag to co-operative societies for these three grades. Through this measure it is hoped to give further stabilization to the kaffircorn market.

It is hoped that with this minimum price to the producer, the price to the consumer will be maintained at a reasonable level.

Should this prove not to be the case in practice, then the fixing of consumers' prices will also be considered. (See *Government Gazette Extraordinary* of 29 September 1944).

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1st July to 30th June).	Summer Cereals. (*a*)	Winter Cereals. (*b*)	Hay. (*c*)	Other Field Crops (*d*)	Pastoral Products. (*e*)	Dairy Products. (*f*)	Slaughter Stock. (*g*)	Poultry and Poultry Products. (*h*)	Combined Index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938–39	92	107	96	89	79	102	106	92	92
1939–40	86	107	77	95	115	105	106	89	103
1940–41	109	113	106	156	102	108	110	104	108
1941–42	121	134	143	203	102	131	134	145	123
1942–43	160	149	144	159	122	147	167	173	146
1943—									
January	160	152	135	116	121	138	165	159	143
February	163	152	133	117	122	138	156	198	145
March	161	152	145	120	122	138	159	230	147
April	159	152	145	143	122	138	163	279	151
May	169	152	147	158	122	162	165	337	159
June	169	152	169	166	122	162	166	214	152
July	170	152	178	187	122	175	182	195	156
August	170	152	179	181	122	181	184	182	156
September	169	152	186	184	122	181	201	180	158
October	169	152	161	189	122	181	198	169	157
November	169	183	127	208	122	144	197	171	159
December	169	183	124	204	122	144	194	200	160
1944—									
January	168	183	137	179	122	144	183	215	158
February	168	183	134	188	122	144	176	235	158
March	167	183	124	179	122	144	174	240	157
April	167	183	132	262	122	144	170	279	162
May	183	183	158	289	122	169	166	273	167
June	182	183	170	315	122	169	161	256	166
July	182	183	147	317	122	195	163	187	163
August	182	183	147	343	122	195	170	160	163
September	182	183	160	393	122	195	175	154	166

(*a*) Maize and kaffircorn.
(*b*) Wheat, oats and rye.
(*c*) Lucerne and teff hay.
(*d*) Potatoes, sweet-potatoes, onions and dried beans.
(*e*) Wool, mohair, hides and skins.
(*f*) Butterfat, cheese milk condensing milk.
(*g*) Cattle, sheep and pigs.
(*h*) Fowls, turkeys and eggs.

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

Season (1st July to 30th June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade I.		Natal.	O.F.S.	Transvaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939-40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940-41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941-42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942-43	13 7	12 6	15 8	15 11	16 9	17 8	15 3	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	6 5
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 4	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	16 6	14 10	11 6
April	23 1	21 11	30 2	30 4	29 9	25 11	25 4	30 2	24 0
May	27 10	26 7	30 7	29 6	29 4	28 10	29 2	28 10	26 3
June	29 8	27 8	—	—	30 0	29 11	29 7	29 8	28 4
July	30 0	—	—	—	29 6	29 11	28 3	30 0	30 0
August	33 1	—	—	—	30 0	32 7	35 3	30 9	32 3
September	36 5	—	—	—	—	—	36 0	—	—

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.).			Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.).		Dry Beans (200 lb.). bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. Producers' Stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cowpeas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	32 5
1944—									
January	5 0	3 7	7 0	5 10	20 3	20 5	62 4	25 11	35 2
February	5 2	3 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March	4 11	3 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6
April	5 3	4 6	7 2	3 9	17 9	17 7	71 6	38 9	44 0
May	6 4	3 9	7 3	4 4	18 0	18 6	71 8	37 11	54 5
June	6 9	5 6	7 5	4 11	16 10	16 10	96 1	42 0	78 10
July	5 9	4 11	7 6	4 7	16 2	16 2	92 3	42 0	64 8
August	5 10	4 10	7 7	4 3	15 2	15 2	88 10	38 5	75 3
September	6 3	4 2	6 0	5 0	15 5	15 5	97 10	34 2	78 5

(a) Municipal Market.
(b) Seasonal year for Kaffircorn, 1 June–31 May; Dry Beans, 1 April–31 March; Lucerne and Teff 1 July–30 June.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1st July to 30th June).	ONIONS (120 lb.). Johannesburg. Transvaal.	Johannesburg. Cape.	Cape Town. Cape.	Pretoria. Cape.	Durban. Local.	Durban. Cape.	Sweet Potatoes. (120 lb.). Johanburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939–40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940–41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941–42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942–43	13 8	14 0	12 6	14 7	12 9	15 5	9 8	8 1	8 5
1943—									
January	8 5	9 4	7 8	9 6	8 1	11 5	10 2	7 6	10 4
February	7 10	10 9	7 3	11 3	5 1	12 4	12 0	9 2	9 4
March	8 1	11 0	8 7	12 2	8 5	10 3	9 6	9 10	8 8
April	11 6	12 10	9 10	13 0	9 4	14 9	9 9	9 9	7 1
May	16 4	15 8	13 2	17 3	15 6	18 2	8 0	7 6	7 11
June	17 3	17 4	15 3	18 1	12 0	18 9	8 5	8 6	9 2
July	17 9	20 2	16 5	19 3	20 7	23 1	7 11	8 0	8 6
August	17 8	23 3	21 4	27 9	21 4	23 0	9 3	10 0	12 4
September	26 6	26 8	24 9	26 8	26 4	28 6	11 4	10 3	12 7
October	19 4	23 10	24 5	21 4	34 5	30 0	13 2	11 3	11 0
November	16 5	—	19 7	—	22 9	25 1	13 5	11 11	10 8
December	12 11	13 10	9 3	15 1	18 6	16 6	12 0	10 5	9 9
1944—									
January	11 3	10 9	8 8	12 3	9 6	11 7	14 2	9 4	11 10
February	12 7	14 0	7 10	11 7	12 9	13 9	15 8	10 10	11 6
March	14 4	14 10	11 1	15 0	13 5	15 1	12 11	8 6	10 10
April	16 6	16 11	13 7	17 0	14 0	18 2	12 6	8 8	9 8
May	17 2	19 10	15 6	19 7	20 3	21 7	12 3	13 5	9 6
June	26 1	21 11	18 8	23 2	22 2	22 11	16 2	14 9	11 1
July	14 9	21 6	18 6	21 2	24 5	23 11	16 10	12 4	11 2
August	14 2	21 7	17 11	22 8	23 7	23 5	20 8	22 3	18 10
September	23 3	27 10	22 0	26 7	27 8	26 7	29 4	29 2	23 6

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1st July to 30th June).	CABBAGES (Bag). (a) Johannesburg.	Cape Town.	Durban.	CAULIFLOWER (Bag). (a) Johannesburg.	Cape Town.	Durban.	TOMATOES (Trays 15 lb.). Johannesburg. N.M. No. 1.	Johannesburg. Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941–42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942–43	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2
February	7 5	7 8	22 2	6 8	—	—	4 7	1 9	2 9	2 3
March	13 4	10 6	25 7	10 4	8 11	15 6	6 8	3 3	2 5	2 5
April	11 3	10 11	22 8	9 1	8 5	12 2	5 11	2 10	3 1	2 4
May	11 11	7 10	18 0	10 5	8 2	13 10	5 6	2 10	3 8	2 5
June	12 2	8 9	12 0	11 10	10 2	11 11	4 10	2 6	4 0	1 8
July	9 10	8 10	8 5	7 8	7 2	7 2	4 7	2 4	2 10	1 0
August	8 11	6 7	7 1	5 1	6 2	7 1	3 5	1 7	2 4	1 5
September	12 11	8 1	14 1	14 4	6 5	18 11	3 3	1 8	2 8	1 2

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb. Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1st July to 30th June).	Eggs.			Fowls (Live, each).			Turkeys (Live, each).		
	Johannesburg, New-laid. Per Dozen.	Durban, New-laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939–40.........	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940–41.........	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941–42.........	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942–43.........	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January.......	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February......	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March.........	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April.........	3 3	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May...........	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June..........	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July..........	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August........	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September.....	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October.......	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November......	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December......	2 [illegible]	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 3
1944—									
January.......	2 4	2 4	17 3	4 7	4 10	5 0	16 10	19 4	13 11
February......	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March.........	2 10	2 9	19 10	4 1	4 11	4 7	13 5	18 3	13 4
April.........	3 2	3 5	24 5	4 2	5 3	4 1	15 0	17 0	13 8
May...........	3 2	3 6	24 9	5 0	5 5	4 2	13 8	15 8	13 11
June..........	3 0	3 3	20 1	5 7	5 7	5 1	14 10	16 9	13 9
July..........	1 9	2 1	16 8	5 11	5 9	6 4	16 2	15 11	16 4
August........	1 4	1 4	12 10	6 1	5 9	6 9	19 3	20 1	19 1
September.....	1 4	1 5	10 8	5 5	5 10	5 4	21 11	26 1	24 1

Prices of Avocados and Papaws on Municipal Markets.

Season.	Avocados (Per Tray). (a)				Papaws. (b)					
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloemfontein Std. Box.
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.		
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	1 6	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	1 8
1939–40.........	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940–41.........	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9
1941–42.........	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942–43.........	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0
1943—										
January.......	4 3	—	3 9	6 4	2 8	1 8	2 0	3 9	3 1	1 8
February......	2 3	—	2 8	5 8	2 6	1 9	3 6	4 11	6 4	2 6
March.........	2 1	1 1	2 7	3 7	2 11	1 9	3 9	5 2	4 10	2 11
April.........	2 3	0 10	2 6	3 9	4 2	1 10	3 3	4 4	6 0	3 6
May...........	2 5	1 5	2 5	3 9	3 11	1 6	2 11	4 1	3 3	2 9
June..........	2 9	1 5	2 9	4 8	3 0	1 9	2 9	3 9	3 11	2 5
July..........	3 6	2 4	3 3	4 2	2 11	1 8	2 4	3 2	3 0	2 9
August........	4 8	3 2	4 6	5 5	2 9	1 6	2 1	3 4	2 10	2 4
September.....	5 0	3 7	5 9	6 7	3 1	1 9	2 4	3 3	3 5	3 0
October.......	5 2	2 9	5 6	5 11	3 9	1 3	2 5	3 0	3 1	3 0
November......	7 1	3 10	4 11	4 3	3 5	1 2	1 11	2 8	3 8	2 2
December......	4 8	4 6	4 5	4 9	2 11	1 2	2 3	3 3	3 6	2 7
1944—										
January.......	5 0	3 0	4 8	6 8	3 4	1 1	2 1	3 1	2 8	2 7
February......	2 5	1 7	3 1	4 0	1 10	2 4	4 11	5 1	—	2 10
March.........	2 5	1 8	2 9	4 6	5 4	1 9	6 3	7 3	—	3 10
April.........	2 7	1 0	2 9	4 3	4 9	1 4	4 7	5 2	4 9	4 3
May...........	3 6	1 7	3 8	5 1	3 7	1 9	3 5	4 4	4 4	3 5
June..........	6 5	1 10	5 8	6 11	3 11	1 1	2 10	3 8	3 0	2 3
July..........	4 10	—	6 4	6 1	2 6	1 6	3 3	4 4	2 7	2 11
August........	7 9	6 6	6 2	6 11	2 10	1 7	3 4	4 5	3 3	3 0
September.....	9 6	2 0	6 7	6 3	4 0	1 0	2 11	3 6	3 2	3 2

(a) Season 1st January to 31st December.
(b) Season 1st April to 31st March.

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[*Photo on Cover: H. M. Steyn, Lothair.*]

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

The Lament of a Soil Particle.

J. W. Cleghorne, Senior Soil Erosion Engineer, Division of Soil and Veld Conservation.

We soil particles, like humans, must pay rent, and, in the event of failure to meet our liabilities, ejection occurs, followed by death form exposure. As tenants, we have a pleasant existence. How safe and sheltered we are domiciled where we belong. We and our hosts—the sand grains around which we are clustered—have a complete understanding, our only desire being to assist Nature by the addition of our quota to that wonderful power which not only creates, but also regulates the material world.

To achieve this object, our homes have been founded in and on the soil surface; the walls and roof-coverings of these homes are constructed of grass, while humus in the form of decaying grass provides the floor-coverings. We occupy these strange dwelling as very peculiar tenants. For instance, the roofs and walls of our homes demand continuous attention and repair to enable them to leak as uniformly and as gradually as possible, while we, to be thoroughly efficient, must reside under the floor-covering—the carpet of humus. To create such living conditions unaided is impossible. Fortunately, success in this direction can be achieved by co-operation, i.e. we co-operate with the water and grass, and Nature blesses this soil-water-grass trinity.

We soil-particle tenants pay rent for this housing, however, in the form of conserved water for the provision of the necessary sustenance for the maintainance of the walls, roofs and floors of our houses by promoting the vigorous growth of the grass, our landlord. The grass in return, like a good landlord, provides ideal housing conditions: it keeps our domiciles in such a perfect state of repair that the force of the raindrops is dissipated, by the interposition of the grass, to such an extent that the water falls gently on the humus carpet under which we reside. The beneficence of our landlord does not end there: he is continually replenishing the humus carpet to reduce still further the power of the raindrops, so that the rainwater reaches us slowly and gently as if it were soaking through blotting paper. Time is thus allowed to enable us to store it in multitude of minute natural underground dams.

As a result of this good treatment we feel that an increased rental is just, and we gladly pay by conserving rainwater where it falls, so that it is constantly available for use by the grass as required. This perfect co-operation completes the cycle, and as a result the members of this co-operative trinity are in complete harmony with Nature, and are enabled to maintain man and beast in health, happiness and contentment.

But . . .

Man, with his incorrect farming methods, makes it impossible for the cycle to repeat itself in the same order, and with the necessary intensity. The result is that the power of the cycle is constantly being reduced with such ever-increasing rapidity that its destruction is inevitable.

And how does man interfere with this vital cycle? The majority of farmers, quite unintentionally, due to lack of knowledge, and for other reasons, conduct their grazing operations in such a manner that initially our landlord, the grass, deteriorates slowly, and finally at an astonishing rate until complete denudation results, and we soil particles are left exposed and totally unprotected.

 [*Continued on page* 781.

FARMING IN SOUTH ... AFRICA

Vol. 19 DECEMBER 1944 No. 225

Editorial:

Are Fertilizers a Danger?

RECENTLY there has appeared in our agricultural press considerable correspondence warning farmers against the continued application of mineral fertilizers, particularly superphosphates, the use of which is reputed to be threatening our agriculture with ruin. In the main, these views are based on the work and ideas of a certain school of agriculturists whose chief concern seems to be to make propaganda for the use of compost and natural organic manures. Unfortunately, these people are sometimes misled by their zeal into making misleading statements which are not supported by scientific data. It is, of course, an easy matter to claim that farmyard manure or compost is just as good as a mineral fertilizer, for everybody has noticed at some time or another that a liberal application of manure has a marked effect on the appearance of the crop. From that point it is only a small step to claim that natural manure or compost is better than artificial fertilizer, and by giving the imagination a little scope it can next be deduced that mineral fertilizers are harmful and constitute a great danger to the country.

It is well known that the use of a good quality stable manure, kraal manure or compost is an excellent means of improving the soil and increasing the yields of certain crops, but this fact by no means justifies the loose statements that are made nowadays, viz., that manure is better that artificial fertilizer, that compost can take the place of superphosphate, that mineral fertilizers deplete the soil, and that soil erosion is largely caused by the continued use of superphosphates. According to the circumstances there may be a small measure of truth in these allegations, just as the assertion that wine is more nutritious than milk, that a little soup is better than a plate of food, and that meat is a poison cannot be dismissed as entirely untrue. But just as little as the sane housewife will fall into a panic when she hears these assertions about food, so little ought the intelligent farmer to be worried about these criticisms of superphosphate and other artificial fertilizers. For normal conditions they are of no account.

Dealing more particularly with superphosphate we find that this substance is par excellence the fertilizer used by Union farmers and recommended by the Department. Chemists have found that, with one or two exceptions, South African soils are amongst the poorest in the world in respect of the very important plant-food constituent, phosphoric oxide. Many a farmer accordingly knows from personal experience that his crop yields can be markedly increased by using superphosphate, which contains this constituent in highly available form. It will therefore be readily understood why it is customary for the Department's experts to advise farmers that their first step should be to use superphosphate. This does not mean, however, that nothing further need be done. By continual ploughing and cultivation of the soil the humus (organic matter) which is present in every good virgin soil and which is an indispensable constituent of fertile soil, is destroyed and the physical condition of the soil so impaired that crop yields are diminished and the large [illegible] is at

first obtained from superphosphate are no longer possible. In such cases soil erosion may increase alarmingly, especially if cultivation is downhill. It is not correct to say, however, that superphosphate is responsible for this state of affairs. The same deterioration of cultivated lands would have resulted without the application of supers.

To prevent this deterioration of lands several measures may be resorted to, e.g. ploughing and cultivating along the contour, allowing the soil to lie fallow for one or more seasons, the application of a suitable system of crop rotation, green-manuring, and the use of farmyard manure or compost. The vegetable grower who is forced to cultivate and plant his small piece of ground without giving it any rest, knows from time immemorial that, unless he applies manure or compost liberally, he cannot maintain his soil in proper condition. The large-scale maize farmer, on the other hand, has only in recent times come to the conclusion that there is something wrong with his system of ploughing, clean cultivation and fertilizing with supers. The fault does not, however, lie in the use of superphosphate but is due rather to the destruction of the organic matter in the soil and to other faulty cultural practices. This must not be taken to imply that superphosphate is the best fertilizer for soil and crop under all circumstances, for it is admitted that there are cases where other forms of phosphate (e.g. rock phosphate or bone) or mixed fertilizers or organic manure would be better.

Apart from the beneficial influence which compost and other natural organic manures have on the physical condition of the soil and its water-holding capacity and aeration, it must be pointed out that a good crop yield is only possible if the plant roots can find a sufficient supply of food in the soil. Usually the total amount of plant food constituents present in the soil is many times that required by the crop, but as they are present mainly in unavailable forms, the plants cannot utilize them. For this reason and also because the soil should not be robbed of its plant-food ingredients, we apply manure or fertilizer to our lands. A good farmyard manure (or compost) contains approximately $1\frac{1}{4}$ per cent. nitrogen, $\frac{1}{2}$ per cent. phoshoric oxide and 2 per cent. potash. Only about a quarter of this can be utilized by a crop during a growing season of 4 to 5 months. If an application of 10 tons of manure per morgen is given, the crop in the first year has 60 lb. nitrogen, 25lb. phosphoric oxide and 100 lb. potash as its disposal. These quantities, particularly the phosphoric oxide, are, however, not sufficient for the production of a really satisfactory crop of maize (or other farm crop). However, it is practically out of the question for the maize farmer or any other large extensive producer of farm crops to apply even 10 tons of manure or compost per morgen to all his land. The most that can be expected of him is that he should give a small section of his lands an organic dressing every year. For the rest he must have recourse to the more concentrated and more easily available artificial fertilizers. The intensive vegetable producer or wine farmer, on the other hand, can profitably apply 10, 20 or more tons of manure or compost per morgen as his farm is small and his production per morgen high.

The Department's advice to farmers is that they should do everything possible to augment their supplies of natural organic manure e.g. by making compost on a large scale, but that they should at the same time make the fullest use of any available supply of mineral fertilizers, especially superphosphate. Extension officers, colleges of agriculture, this Division and many other department institutions are always ready to give advice to farmers on

[Continued on page 774.

New Under-Secretary for Agriculture and Forestry.

IN October, 1944, Lt.-Col. C. J. van Heerden, the former Assistant-Director of Veterinary Services (Field section), was appointed Under-Secretary for Agriculture and Forestry in the place of Dr. C. H. Neveling who is going to devote all his time to matters pertaining to the Marketing Council, of which he is vice-chairman.

Lt.-Col. C. J. van Heerden.

Lt.-Col. van Heerden was born on 18 December, 1896, in Victoria West where he received his early education, and from there he continued his studies at the S.A. College in Cape Town.

During the World War of 1914-18 he took part in the campaigns in South-West Africa and East Africa, and in 1919 he was granted a government bursary for study in Veterinary Science at the Balls Birdge College of Veterinary Science in Dublin where he obtained the M.R.C.V.S. degree in 1923. In November 1923 he was appointed Government Veterinary Surgeon in the districts of Nongoma, Eshowe and Piet Retief.

In 1930 he was promoted to the position of Senior Veterinary Surgeon with headquarters at Pietermaritzburg. He was next promoted to the post of Sub-Director and transferred to Pretoria in 1933. Here he had control over the large and extensive field section of the Division of Veterinary Services, and played a prominent part in the combating of foot and mouth disease, etc.

In 1937 he already held the position of Assistant-Director of Veterinary Services until the outbreak of the present war, when, in April, 1940, he enlisted as Deputy-Director of Veterinary Services (S.A.V.C.), with which the Mounted Forces were incorporated in May, 1944.

On 20 October, 1944, Lt.-Col. van Heerden was recalled from the army in order to fill the position of Under-Secretary for Agriculture and Forestry.

Farming in the Cape Midlands.

Dr. L. L. Roux and H. A. J. Stead.*

THE region known as the Cape Midlands constitutes a large part of the area served by the Grootfontein College of Agriculture, and comprises the districts of Colesburg, Cradock, Graaff-Reinet, Hanover, Middelburg (Cape), Murraysburg, Richmond and Steynsburg.

The accompanying map indicates the position and extent of the total area involved, and also illustrates the different rainfall areas.

FIG. 1.—Districts of the Cape Midlands.

The topography throughout the area is typical of that of the Karoo with extensive high plateaus and irregularly placed mountains and kopjes which vary considerably in height. The altitude of the area varies greatly and ranges between 3,500 feet to over 8,000 feet above sea level.

The rainfall varies from below 10 inches to just over 20 inches, the annual average over the greater part of the area being 10 to 15 inches. It seldom rains during the winter months. Normally, slight falls occur during the spring and early summer months but the bulk of the rains is experienced during autumn.

Soil Types.

The soils are of doleritic origin (Beaufort Series). The hills consist mainly of dolerite over layers of sedimentary shale.

The higher-lying soils consist of red Karoo sandy loam or loam with layers of limestone ranging from a few inches to several feet in thickness at varying depths below the surface. These soils are generally well supplied with potash and phosphorus plant foods.

* Compiled with the assistance of officers of various Sections of the Grootfontein College of Agriculture, Middelburg, Cape.

The low-lying or vlei soils are darker in colour and up to 30 to 40 feet in depth, consisting largely of the finer soil particles from surrounding areas. Their darker colour is due to varying organic matter contents.

On the whole, these soils are fertile where not too alkaline or brak, and are mainly used for cultivation where this is practised. The deeper soils are particularly suitable for the principal crop of the Karoo, namely lucerne.

Flora.

The plants on which stock graze in the Karoo are much more varied in type than in these parts of the Union where the natural veld is grassveld. Typical Karoo vegetation such as seen on the flat veld gives an impression of innumerable small woody bushes, mostly not taller than a foot in height, separated from each other by bare patches of ground. This relatively sparse spacing of plants is due to a scarcity of soil moisture during most of the year, so that each plant needs a bigger share of ground than is usual in order to satisfy its water requirements. Karoo veld is composed of a great number of grasses, as well as other plants and bushes. It may vary considerably according to the different soil types, physical features such as kopjes, and climatic conditions such as average temperature, as well as to variations in moisture due to rainfall or drainage. Wherever the ground is inclined to be moist, as for example in any little hollow where water tends to collect after a rain, grasses are proportionally more abundant. If the ground is sufficiently moist, grasses take complete possession and bushes disappear.

After the summer rains have fallen, a host of short-lived annuals, many of them palatable fodder plants, spring up. In the more arid areas, the veld at this period may be completely carpeted with flowers and present a truly gorgeous picture. Several Karoo plants have worthily been selected as ornamentals for cultivation in gardens.

On this mixture of bush, grass, and annual plants all classes of stock thrive. They are able to maintain their condition under a rainfall that would spell a disastrous drought in other regions. The winter-feeding problem is largely minimized by bushes such as the "ganna" which retain their succulence, and consequently their milk-producing properties at this usually awkward time of the year.

As is the case elsewhere, the farmer has to cope with some undesirable plants in the Karoo. There are a few well-known poisonous plants such as "bietou" which causes prussic-acid poisoning, the common "dubbeltjie" which is responsible for "geel-dikkop" in sheep, and a bush which causes vomiting sickness, mostly in sheep and goats. Injurious seeds such as "steekgras", bur clover and burweed are serious impurities in wool and mohair. Certain veld weeds such as "bitterbos" and "rhenoster bush" may become serious when veld is overgrazed. Taking everything into consideration, however, the Karoo farmer cannot grumble about his veld. His animals grow out well and are robust—an excellent tribute to the nutritive value of his varied assortment af natural fodder plants.

Farming Systems.

The Cape Midlands is considered to be a good livestock area. Various classes of livestock are maintained under extensive grazing conditions, but stud breeding is conducted intensively where adequate feed is available. Limited areas are under irrigation, as for example those under the Fish River schemes and the Van Ryneveld Dam.

The products produced under irrigation vary, depending upon the soil and climate. In the majority of cases, animal feeds are produced and, although some of this feed is fed to livestock, much of it is sold in the form of cash crops.

The extensive stock enterprises involve sheep farming as a major undertaking, and cattle, or cattle and horses, as a minor. Where cattle and horses of high-producing quality and particular excellence are kept, supplementary feeding has generally to be resorted to. This is due not so much to any deficiency of nutritive value in the veld as to lack of quantity, especially during the long dry, extremely cold winter months and during prolonged droughts. The area is eminently suited to merino-sheep farming, while the fat-tailed and fat-rumped breeds of sheep do exceptionally well as they are particularly hardy. In most parts the carrying capacity is 2 sheep to three morgen.

The nature of the veld has restricted the division of the area into farms of an average of 2,000 morgen. There are, however, many farms of 5,000 morgen. The price of land varies greatly, and at present land values are abnormally high. Moderately developed farms are considered to be worth from £2. 10s. to £3. 10s. per morgen.

FIG. 2.—Stacks of lucerne: A good fodder bank.

In 1933 the average value of land, including inmprovements, etc., of 370 farms in the Middelburg district was given as £2·83 per morgen. The average rateable value per morgen in the same district (not including improvements other than buildings) was given as £1·96.

Feed Production.

On the whole, conditions are not favourable for crop growth, and efforts in this direction should be directed to feed production for farm consumption.

Lucerne is one of the principal crops grown in the area because of its high yielding ability, its high feed value, and its adaptation to the prevailing climatic conditions. It is used both as a hay crop and as a grazing crop, and is being utilized increasingly for ensiling with or without other crops.

In order to utilize winter water, wheat is grown as widely as lucerne, but much of the crop is grown under natural rainfall conditions although the normal rainfall does not necessarily ensure a good grain crop. A certain amount of grazing is usually obtained during early growth. Silage crops such as maize and sorghums should be grown more widely where cattle are kept, and greater use of drought-resistant crops such as spineless cactus, saltbushes and fodder trees would do much to reduce drought losses and prevent overgrazing during periods of scarcity.

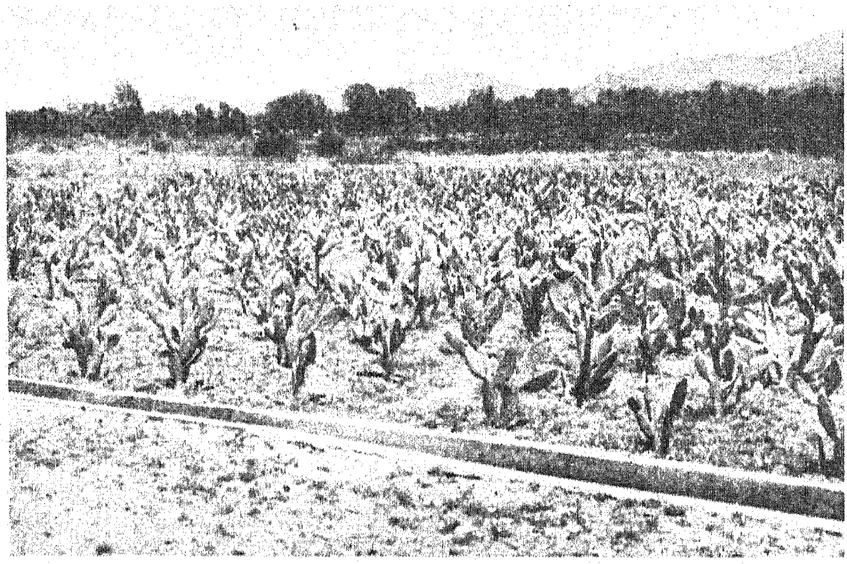


FIG. 3.—A young plantation of spineless cactus.

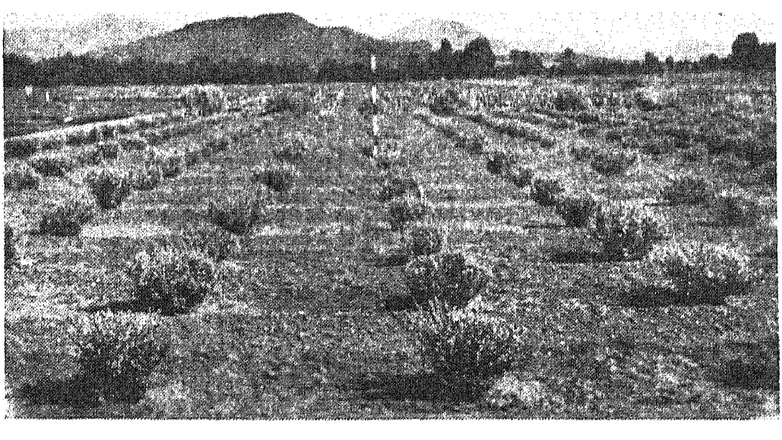


FIG. 4.—An Oldman-saltbush plantation trimmed down after grazing.

Livestock.

The table below reflects the position in the individual districts with regard to farm areas and livestock populations. The latter have been expressed in numbers per 100 morgen in order to permit a comparison of livestock intensity. Steynsburg and Cradock have the densest cattle population. These two districts and Hofmeyr have most small stock per unit area.

Table showing the livestock population of the Cape Midlands in August 1939. (*Figures taken from Agricultural Census No.* 19).

District.	Total area of farms. mg.	Cattle.		Sheep.				Goats.			Sheep and Goats.		Wool Production.	
				Woolled.		Non-woolled.								
		Total.	Per 100 mg.	Total.	Per 100 mg.	Total.	Per 100 mg.	Angora.	Other.	Total.	Total.	Per 100 mg.	Total lb.	Per 100 mg. lb.
Colesberg........	677,313	9,284	1·4	337,171	49·8	28,438	4·2	1,414	5,163	6,577	372,186	55·0	3,319,304	490·1
Cradock..........	677,571	12,508	1·8	464,041	68·5	37,902	5·6	30,610	17,581	48,191	550,134	81·2	4,070,745	600·8
Graaff-Reinet.....	771,987	11,317	1·5	414,346	53·7	62,963	8·2	17,763	29,854	47,617	524,926	68·0	3,794,592	491·5
Hanover..........	491,740	1,956	0·4	221,004	44·9	10,427	2·1	—	1,364	1,364	232,795	47·3	1,958,990	398·4
Hofmeyr..........	255,015	3,276	1·3	168,426	66·0	4,627	1·8	449	1,477	1,926	174,979	68·6	1,284,345	503·6
Middelburg.......	674,728	8,323	1·2	323,368	47·9	31,557	4·7	436	5,432	5,868	360,793	53·5	2,697,317	399·8
Murraysburg......	606,793	2,147	0·4	272,982	45·0	20,646	3·4	7,773	8,116	15,889	309,517	51·0	2,593,478	427·4
Richmond........	835,753	2,588	0·3	321,182	38·4	13,511	1·1	446	4,175	4,621	339,314	40·6	3,094,412	370·3
Steynsburg.......	320,201	8,441	2·6	196,295	61·3	7,325	2·3	460	513	973	204,593	63·9	1,643,533	513·3
TOTAL....	5,311,101	59,840	—	2,718,815	—	217,396	—	59,351	73,657	132,846	3,069,231	—	24,456,711	—
AVERAGE.	590,122	6,648	1·2	302,091	52·8	24,155	3·8	7,418	8,186	14,760	341,026	58·8	2,717,412	466·1

The figures for 1939 have been chosen as they represent a state approximating the normal, or at any rate one unaffected by the abnormal influences of war-time tendencies.

The figures of wool production are evidence of the immense quantity of wool grown in the Cape Midlands—Cradock, Steynsburg, and Hofmeyr producing the largest amounts of wool per unit area. The wool types of the Karoo are known throughout the world for their superior qualities and especially for their soft handling.

Sheep.

Of the sheep in the nine districts 89 per cent. are woolled and produce an annual total (from sheep and lambs) of over 24 million pounds weight of wool which, at an average of 12 pence a pound, would be valued at nearly £1,500,000.

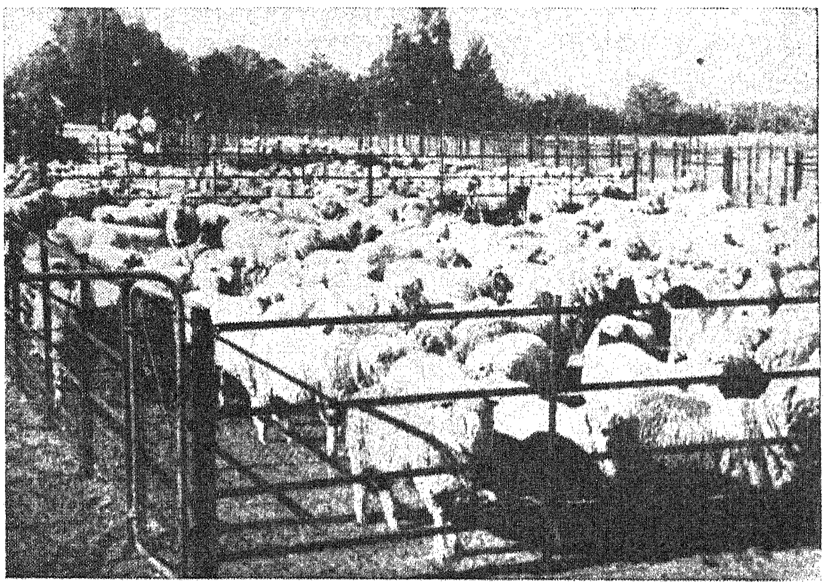


FIG. 5.—Merino flock ewes.

Sheep farming in this area has gone through many stages of development, and methods of management are fairly advanced. Sheep and wool classing have assisted materially in promoting the development of improved types with high wool yields. Free ranging, which has been made possible by jackal-proof fencing, has added greatly to the production of sound clean wool. The subdivision of farms into camps or paddocks which are supplied with water and the provision of dipping tanks, footbaths and shearing sheds have all helped to facilitate the application of improved methods of management. Even under the semi-arid conditions of the Karoo, internal parasites (stomach and intestinal worms) have become a menace, but it has been found possible to combat worms by systematic dosing with suitable remedies, many of which are issued by the Onderstepoort Laboratory of the Department of Agriculture and Forestry, Pretoria.

The subdivision of camps also permits of better control of the veld. The importance of veld management is only now being seriously considered. Most farmers are aware of the detrimental

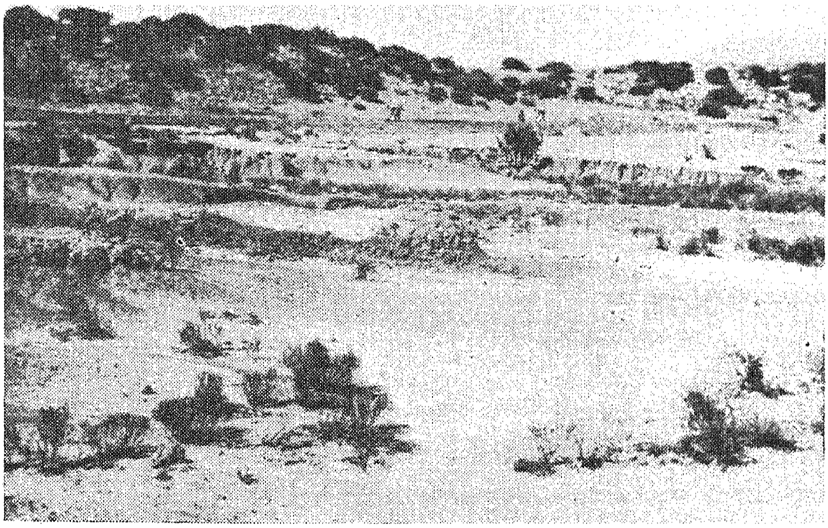


FIG. 6.—A serious stage in erosion.

effects of overstocking, and some have now begun to realize the importance of maintaining a good veld cover of high feeding value not only by guarding against overstocking, but also by judicious grazing. The inability of certain individual farmers to appreciate the dangers of overstocking has resulted in serious destruction of the soil cover and, consequently, in soil erosion. The Government has undertaken large reclamation schemes in the Hofmeyr district with the object of ascertaining the best methods and of demonstrating them on a large scale. It is now generally accepted that the natural or normal soil cover of the Karoo veld is not only Karoo bush, but mixed veld with good bush and grasses of a high nutritive level.

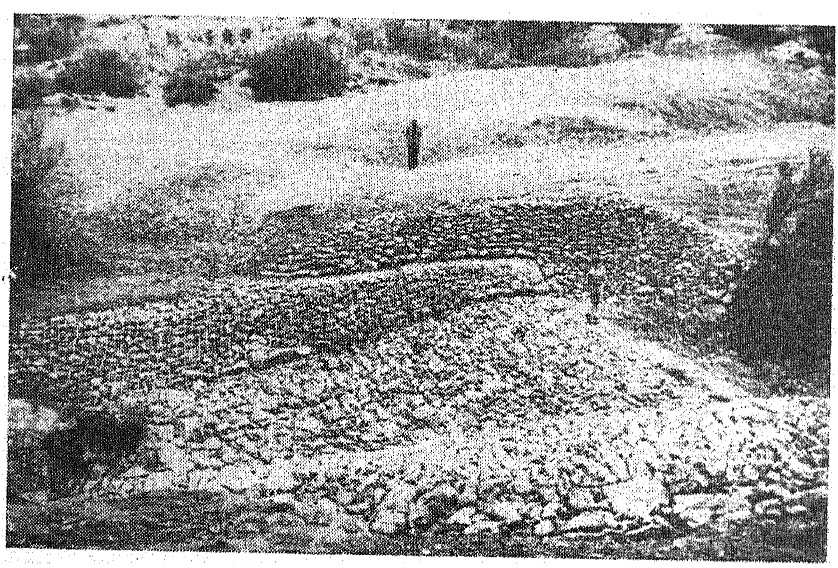


FIG. 7.—Stone in wire weir to check scouring of donga.

Large commercial flocks of several thousands of sheep are owned by individual farmers, many of whom also maintain stud sheep as a special enterprise for the sale of stud rams to districts all over the Union. These rams are well known and much sought after because of their great size, good constitution and well developed bone.

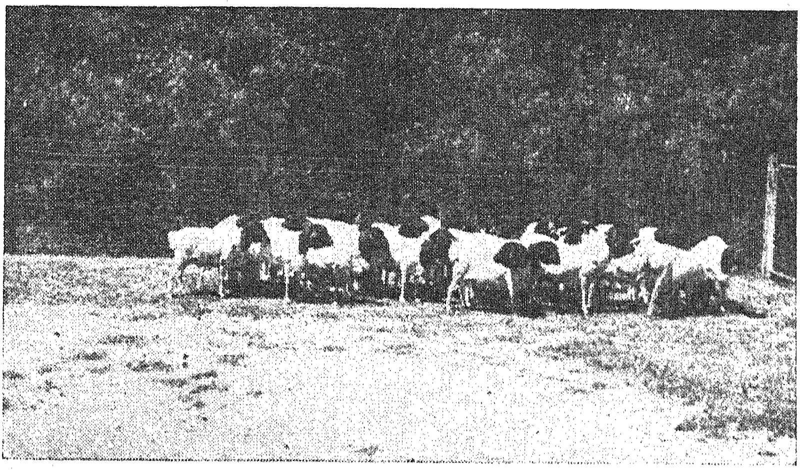


FIG. 8.—A group of Blackhead Persian ewes.

The best lambing season is in autumn, as lambs born at this time are the healthiest. Lambs born during spring are often inhibited in their growth due to internal parasitic infestation at the early age of 3 to 4 months.

Although 89 per cent. of the sheep of the Cape Midlands are woolled, the non-woolled types also play an important role. The latter are fat-tailed (Afrikaner) and fat-rumped (Blackhead Persian) types which are exceedingly hardy and highly fertile. Their mutton qualities are not very good, due to slow maturation, poor and unequal

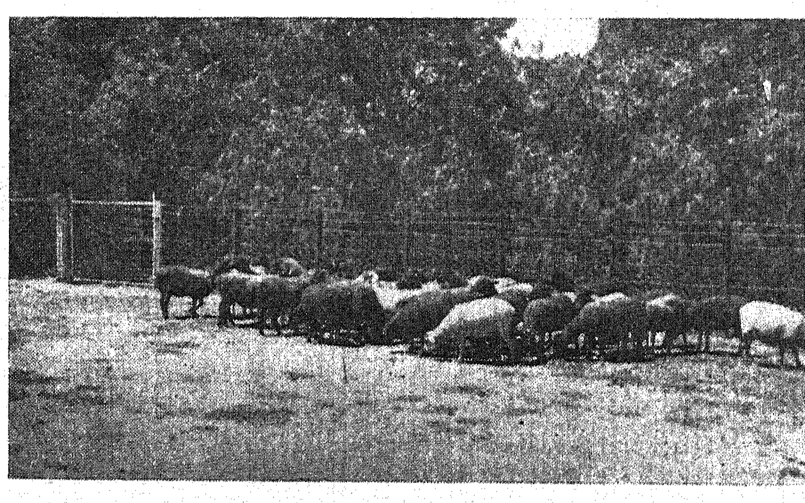


FIG. 9.—Southdown-Blackhead Persian halfbred ewes.

fleshing and a very marked peculiarity of fat localization. The skins of these non-woolled breeds are valuable. Farmers are undertaking the production of better mutton and lamb by crossing these types with exotic mutton breeds, and even high grades of these breeds are giving good results by producing lambs which are marketable at 5 to 7 months of age.

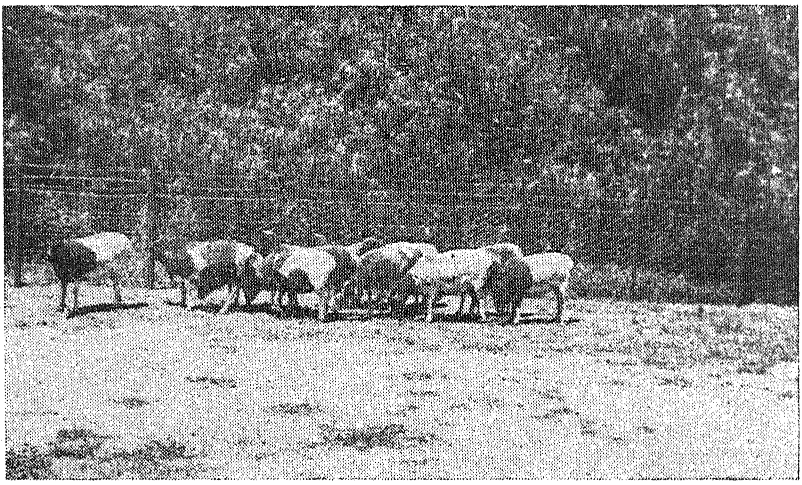


FIG 10.—Dorset Horn-Blackhead Persian halfbred ewes.

Cattle.

There is every indication that the cattle population has decreased during the past 20 years. It is thought that the increase in the number of sheep has been responsible for the change.

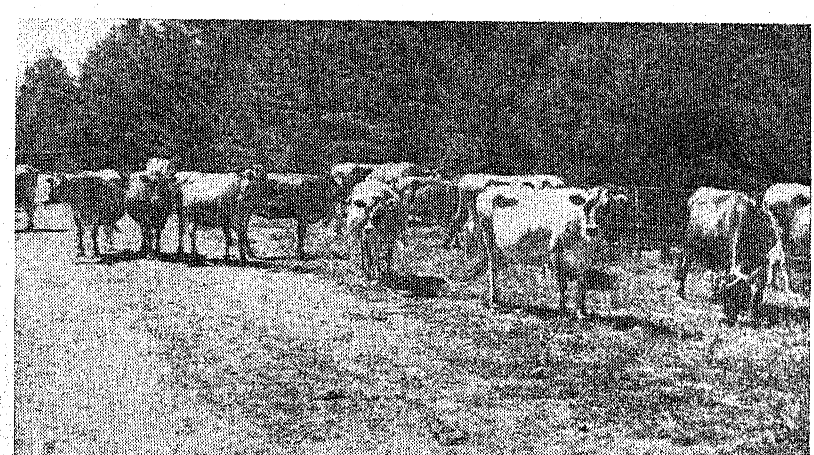


FIG. 11.—A group of stud Jersey cows.

Except for small isolated areas, the Cape Midlands as a whole is suitable only for extensive cattle enterprises, due to the inability of the veld to maintain cattle throughout the year without supplementary feed and also to the frequent occurrence of prolonged

droughts. On the other hand, many cattle breeders have built up lucrative stud-breeding enterprises. In general, successful stud breeders are found to have established themselves on good farms, usually with large tracts of good veld. In the majority of cases where dairy herds are maintained as stud and commercial herds, large quantities of feed have to be purchased and/or produced. Cattle stud-farming enterprises are highly developed and many breeders of the following dairy, dual-purpose and beef breeds are situated in the area:—

Dairy: Friesland, Jersey and Guernsey.
Dual-purpose: Red Poll, Shorthorn and Brown Swiss..
Beef: Shorthorn and Afrikaner.

Horses.

Certain of these districts are some of the best horse-breeding and horse-rearing areas in the Union. The famous Hantam horses of the Colesburg district are well known for their stamina, good bone, and hard hoofs. The whole of the area is eminently suitable for horse breeding.

In so far as horses are concerned, Thoroughbred breeding is by far the most important enterprise. Large numbers of yearlings leave these districts annually for the racing centres. Only isolated cases of breeders of draught horses, such as Percheron and Suffolk, are encountered.

FIG. 12.—Thoroughbred yearlings.

In certain cases breeders are able to rely almost entirely upon the veld for maintaining their brood mares during the major portion of the year. Supplementary feeding is generally necessary for mares heavy in foal and for mares suckling foals. Foals require grain supplements after weaning to maintain satisfactory growth. Lucerne as a pasture and as hay forms the most valuable supplementary horse feed.

The Agricultural College.

The Cape Midlands is served by the Grootfontein College of Agriculture which is situated about 3 miles from the town of Middelburg, Cape. The activities of the College are concentrated upon education and research.

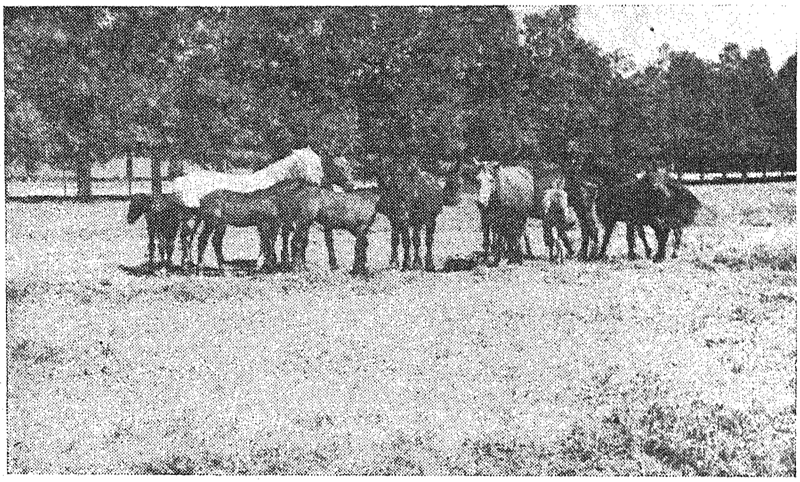


FIG. 13.—Percheron mares and foals.

About 70 to 80 students pass through the College annually. A special course in Sheep and Wool gives a thorough grounding to young men who desire to undertake their own sheep selection and wool classing. The course also fits them for posts in certain commercial spheres.

The research conducted at the College is concerned with all agricultural problems of the area, involving animal and crop production. The special features of the research are sheep and wool, veld management, crop producton under irrigation and the development of suitable hardy and drought-resistant crops and shrubs. The greater part of the sheep research is concentrated upon merino sheep and merino-wool production, but fat-lamb production under irrigation is also being studied and the development of improved hardy types of mutton sheep especially suitable for the Karoo area is an important feature of the work.

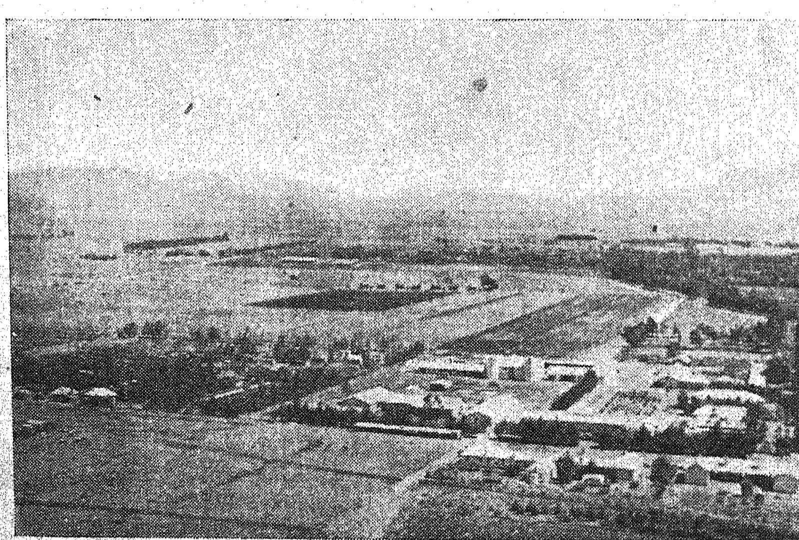


FIG. 14.—A view of Grootfontein College of Agriculture.

Do Pastures Pay?*

Four years' record of established pastures.

J. E. Pons, Extension Officer, Ixopo.

WHEN the establishment of pastures is discussed, the question is often asked: "Do pastures pay?"

In order to gain more information on this subject and at the same time to demonstrate the management of artificial pastures under practical conditions, a co-operative demonstration was laid down on the farm of Mr. J. Voigts, Izotsha, on the south coast of Natal. Accurate figures of production costs were kept by Mr. Voigts, with whose permission these figures are published.

His farm "Rothenberg" is about three miles from the sea. Both the soil and the natural grazing are typical of the area. The former is sandy and poor, and the latter coarse and sour. Samples of the grazing were analyzed and found to be deficient in phosphates, calcium and protein.

Mr. Voigts supplies milk to south coast hotels. Any surplus is sold as cream or butter. Every month the total milk proceeds are divided by the number of gallons produced. The average price thus obtained is taken as the monthly price of milk.

Establishment of Pastures.

Towards the end of the 1938-39 summer, 20 acres of pastures were established at a total cost of £81. 16s. 7d. These pastures consisted of 12 acres of *Paspalum dilatatum*, 4 acres of Rhodes grass, 2 acres of Kikuyu and 2 acres of Napier fodder.

The Paspalum was sown on virgin veld on which a catch crop of potatoes had been grown the previous season. The potatoes received a liberal dressing of fertilizer and manure. The cultivation helped to decompose the organic matter in the soil.

The Rhodes grass was established on virgin soil just ploughed up and harrowed. The stand was good, but the growth disappointing, partly owing to the virgin state of the soil.

The Napier fodder was planted in an old, exhausted mealie field and received no fertilizer during the 1939-40 season. Unfortunately, the grass was not planted in rows.

The Kikuyu paddock, on the other hand, was situated below the cow byres, and the urine, rainwater and water used for flushing the byres were led on to the paddock. This helped to provide large amounts of nitrogen so necessary for Kikuyu.

The pastures were well established in October 1939, and grazing commenced on the 22nd of that month. The 20 acres were divided into 7 paddocks, which were grazed rotatively. Unfortunately, the acreage was too small for the 50 cows which made up the dairy herd so that the cows had also to be grazed on the veld periodically to allow the pastures to recover.

The cows were regularly given a certain amount of hay and concentrates. The milk yields were recorded twice daily.

Grazing Results.

The following are the grazing results and milk yields for the 4 years 1939-43, the period during which the demonstration was conducted:—

* See also "Farming in South Africa", January, 1943, on the first two seasons' results on this subject.

Month.	Paspalum.		Rhodes.		Kikuyu.		Napier Fodder.	
	Days.	Galls.	Days.	Galls.	Days.	Galls.	Days.	Galls.
1939–40.....	79	6676	18	1471	9	758	13	1213
1940–41.....	71	6191	11	963	14	1256	12	1091
1941–42—								
Oct......	—	—	—	—	—	—	—	—
Nov.....	24	2315	—	—	2	196	4	391
Dec......	10	937	—	—	2	296	2	200
Jan.....	9	660	3	216	—	—	4	311
Feb......	8	572	—	—	3	209	2	138
March...	16	1242	3	243	2	165	3	253
April....	20	1653	3	245	2	163	3	241
1942–43—								
Oct......	—	—	—	—	—	—	—	—
Nov.....	14	1234	—	—	6	521	—	—
Dec.....	18	1556	—	—	4	356	—	—
Jan......	6	384	—	—	4	280	—	—
Feb.....	8	465	—	—	2	114	—	—
March...	8	468	—	—	4	237	—	—
April....	7	469	—	—	4	219	—	—
May.....	—	—	—	—	2	114	—	—
TOTAL.	298	24,822	38	3,138	60	4,884	43	3,838

N.B.—The Rhodes grass and Napier fodder were grazed for 3 seasons only, while the Paspalum and Kikuyu were grazed for 4 seasons.

Based on 3 seasons, the average production per acre per season was:—

Rhodes gras: 261 galls. plus 1 ton hay.
Napier fodder: 639 galls.
Based on 4 seasons:—
Paspalum: 519 galls.
Kikuyu: 601 galls.
All pastures: 524 galls.

Disregarding the 4 acres of Rhodes grass, which were a partial failure, 16 acres of good pasture provided sufficient grazing for 50 cows for 400 days, i.e. 20,000 cow-grazing days, these cows producing 33,544 gallons of milk during that period, i.e. 2,097 gallons per acre.

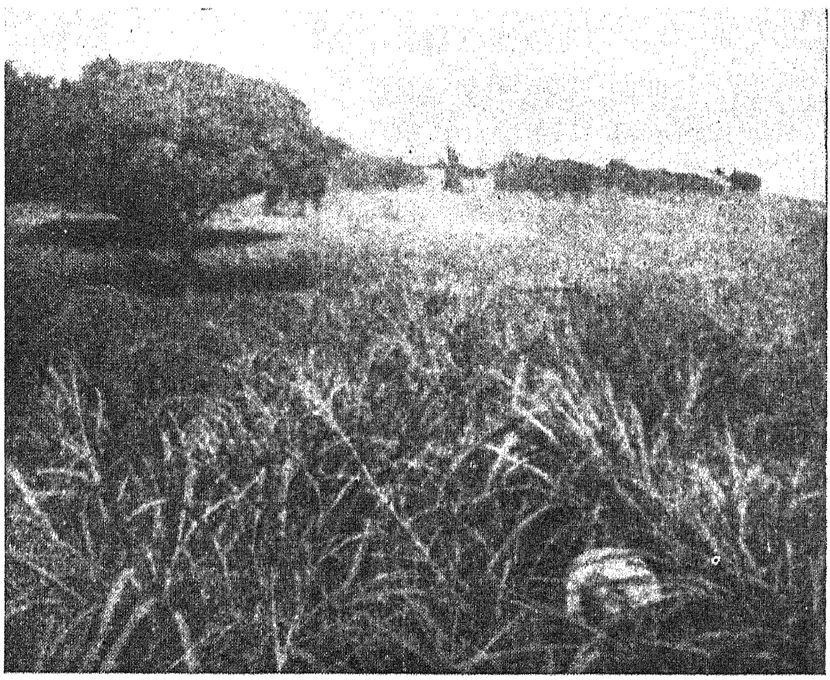
If these figures are taken as a basis, the 16 acres would have provided grazing for 33 cows for 600 days (4 summer seasons of 150 days each). If it is assumed that these 33 cows would have produced the same total number of gallons of milk during 600 days as the 50 cows during 400 days, 1 acre of good pasture could provide sufficient grazing for 2 cows for a period of 600 days (4 seasons) and the total production from these 2 cows would be 3·5 gallons per day.

Similarly, 24 acres would have been necessary to provide sufficient grazing for the total herd of 50 cows for the same period of 600 days. It would therefore have paid Mr. Voigts either to have grazed only, say, 30 of his best producers on the 16 acres, or to have increased the acreage under pastures to 25 to 30 acres.

During the periods of inadequacy of pasture grazing the cows were grazed on 300 acres of natural veld. Records of milk production were kept, but these have not been included in the tables as no useful deductions can be made. There was always a marked reduction

in daily yields as soon as the cows were put on to the veld, and the total annual production was very much lower than from any of the pastures.

Behaviour of the different grasses.—The stand of the Rhodes grass was good, but the yield was rather disappointing from the start. It became so poor that it had to be ploughed up after the third season. This partial failure must be ascribed partly to the virgin state of the soil at the time of planting. Neighbours in the vicinity have, however, had good results from Rhodes grass, and the poor results at Rothenberg must therefore not be taken as conclusive.



Plot of Napier fodder on Mr. Voigts' farm.

At the end of the third season both the Paspalum and the Napier fodder showed signs of deteriorating. The Napier fodder was then ripped up and the Paspalum was kept for a further season. Early spring rains and the application of fertilizer resulted in relatively good grazing being obtained during November and December of 1942, but after that the growth was poor and "Umcheekie" predominated.

The Kikuyu pasture is still in excellent condition after 4 seasons of grazing, and promises to be good for a number of seasons to come. Conditions in the form of fertility and moisture from the byres are, of course, ideal for pastures.

Effect of high rainfall.—As will be noticed, the average yield per acre and per day decreased considerably during the fourth season, both in the pastures and in the veld. This was a very rainy season and the decreased yield may perhaps be ascribed to the fact that the available nitrogen was leached out beyond the reach of the grass roots. In very rainy seasons it is therefore important to apply the total amount of fertilizer in three, four or even more

dressings, if practically possible. It would also be profitable to increase the total amount of fertilizer to be applied in such seasons.

Expenditure and Income.

Expenditure.—The total cost of establishment and maintenance of the pastures, as well as the cost of milking and selling the milk, was as follows:—

	£	s.	d.
Cost of establishment	£81	16	7
Expenditure 1939-1940	147	19	1
Expenditure 1940-1941	197	7	6
Expenditure 1941-1942	293	13	2
Expenditure 1942-1943	241	8	4
	£989	4	8

This amount is made up as follows:—

	£	s.	d.
Ploughing, harrowing and sowing	£5	2	1
Seed	20	7	0
Fencing	18	10	0
Fertilizer and distribution	126	14	8
Weeding	50	18	6
Mowing	8	0	0
Supplementary feed	434	8	1
Transport and labour (milking, feeding and distribution of milk)	264	16	0
Interest on £1,000 for 14½ months @ 5 per cent.	60	8	4
	£989	4	8

N.B.—An interesting deduction is that the cost of establishing and maintaining 20 acres for 4 years is £229. 12s. 3d., which brings the annual maintenance of one acre of pasture to £2. 17s.

Income.

		£	s.	d.
1939-40:	10,118 gallons milk @ 9⅓d. per gallon	£394	4	11
1940-41:	9,501 gallons of milk @ 9½d. per gallon	364	8	3
	2 tons of Rhodes-grass hay @ £1. 10s. 0d. per ton	3	0	0
1941-42:	10,646 gallons of milk @ 10d. per gallon	451	17	2
	2 tons of Rhodes-grass hay @ £1. 10s. 0d. per ton	3	0	0
1942-43:	6,417 gallons of milk @ 11½d. per gallon	314	10	10
		£1,531	1	2
Expenditure		989	4	8
Profit on 20 acres for 4 seasons		541	16	6
Profit per acre per season		6	17	2

Conclusions and Recommendations.

The following conclusions can be drawn from the results of this demonstration:—

Artificial pastures are a payable concern in high-rainfall areas, and in particular along the south coast of Natal.

These artificial pastures far outyield natural grazing and give a handsome profit of £6. 17s. 2d. per acre. The establishment of pastures is therefore specially recommended on small farms such as are often found along the coast of Natal.

One acre of good pasture will provide (roughly) sufficient grazing for 2 cows (with a total milk yield of 3½ gallons per day) for a continuous period of 150 days per season for 3 to 4 seasons.

Wherever possible, the pastures should be grazed rotatively, and the cows should remain on good pasture throughout the summer. The number of cows grazing on the pastures should also match the size of the pastures and be based on the carrying capacity.

Due to the high cost of establishment and maintenance (£2. 17s. 0d.) or more per acre per season), only high-producing animals should be grazed on the pastures.

No conclusions can be drawn as to which of the 4 grasses grown, namely, Kikuyu, Paspalum, Napier fodder and Rhodes grass, is most suitable for the area concerned, as conditions differed too much. All 4 can safely be recommended under south coast conditions. Napier fodder, Paspalum and Rhodes grass will last for 3 to 4 seasons, and will fit well into a system of rotation with annual crops. By such a system soil fertility should be maintained and even improved, and soil erosion prevented.

Kikuyu must be considered a more or less permanent pasture on account of the difficulty of eradicating it again. For this reason it should be established on very fertile soil only, and preferably on sites where the fertility can easily be maintained by adequate manuring. Ploughing up a Kikuyu pasture every few years will rejuvenate is somewhat. In view of the spreading nature of the grass, it should not be planted near gardens or ploughed fields, where it may become a weed.

To ensure the success of pastures, the fertility of the soil should be good before they are established. The following practices are recommended before planting the pasture:—

(*a*) The application of compost or manure, the ploughing in of a green manure and the inclusion of a legume in the rotation. Sunn hemp, dolichos beans, velvet beans and soybeans all do well along the coast and are recommended as green manuring or rotation crops.

(*b*) If possible, a crop such as potatoes, which responds well to heavy dressings of fertilizers, should be grown just before establishing a pasture.

Good seed and proper preparation of the soil are also very important.

Maintaining the pasture in a fit condition for grazing by means of fertilizing, weeding and mowing may be costly, but the trouble and expense involved will be amply rewarded.

Wherever possible the annual fertilizer application should be given in 2, 3, or even 4 dressinge in order to ensure a consistent flush growth of grass.

Pastures will amply repay the attention given to good establishment, and the pleasing picture of contented cows grazing on good pasturage will gladden the heart of all true dairy farmers.

Special praise and thanks are due to Mr. Voigts for the efficient way in which he managed the pasturage and for the trouble taken to keep accurate records.

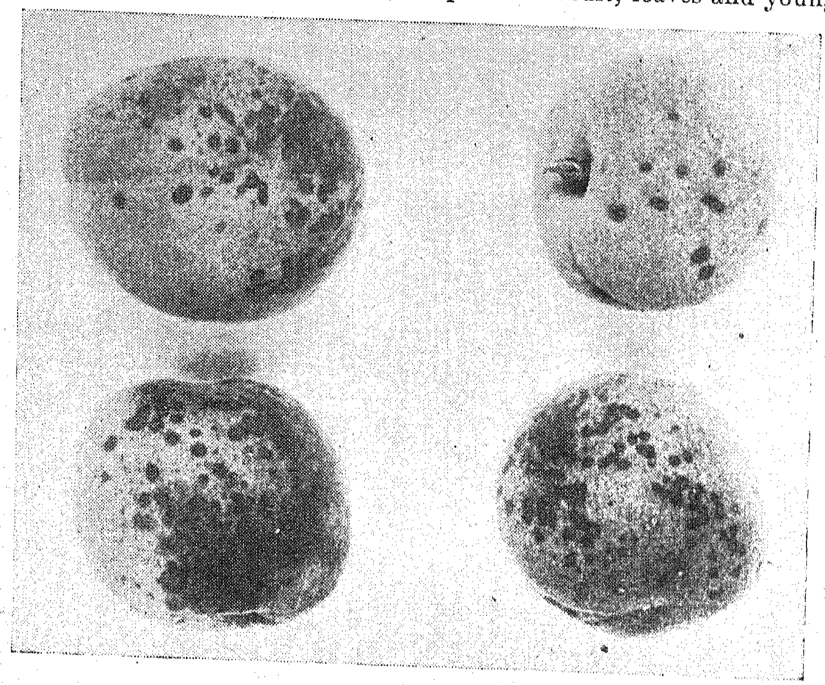
"Foods and Cookery", Bulletin No. 115, *is out of print.*

Bulletin No. 237, *"Eggs and Poultry in Cookery", which contains many useful recipes, is obtainable at* 6*d. per copy from the Editor.*

Peach and Apricot Freckle.

Miss A. M. Bottomley, Division of Botany and Plant Pathology.

THIS disease, known variously as peach freckle, peach scab and black spot, is caused by the fungus *Cladosporium carpophilum.* It occurs throughout the Union, but is most severe in the summer-rainfall areas, attacking mainly late varieties of peaches and apricots and occasionally also nectarines and plums. Fruit, leaves and young



Freckle disease on apricots.

[*Photo: H. King.*

twigs may all be attacked, but the disease is conspicuous only on the fruits which may be completely disfigured and rendered unfit for marketing or even for home use.

Nature of the Disease.

On the fruits the disease first appears as minute, indefinite, greenish-brown spots on the exposed sides. These gradually enlarge and darken until finally they are $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter, round, superficial and dark olive-brown to black in colour. When infection is light, only a few scattered spots may develop, but in severe attacks—associated with wet seasons—the spots are very numerous and may coalesce to form large blackish blotches. In the latter case growth is arrested in the affected areas, the flesh hardens and the fruit cracks. The freckle fungus itself does not cause the fruit to rot, but other organisms may enter the cracks and do so.

When leaves are infected, the disease produces small, irregular spots which are usually so inconspicuous as to escape notice. In severe cases the infected areas may dry up and fall away, leaving small holes, but this is not usual. The disease is more noticeable on young shoots where infection appears as small oval spots of

a yellowish to dark brown colour, surrounded by a darker raised margin. Old lesions which are often more conspicuous in winter, are larger, darker and more depressed.

Peach freckle is usually first noticed about three to six weeks after the petals have dropped. The causal fungus, which harbours in the bark of young shoots during the winter, produces its first crop of spores at about this time and it is these which are responsible for much of the later widespread nature of the disease. They are, however, not detached from the fungus plant until free water such as rain is available, so that unless a spell of wet weather occurs at this time, there is a reasonable chance of killing them before they are able to do much damage. This dependence of the spores on rain for dissemination is probably the reason why, in summer-rainfall areas, early varieties are often free of the disease while late varieties, which mature at the height of the rainy season, are badly freckled.

Control.

Contrary to general opinion, winter treatment does not prevent freckle disease, owing to the fact that the fungus is too deep-seated to be reached by sprays. It can only be tackled in spring after it has developed and produced spores. This has been found to take place a few weeks after the petals have fallen. Spraying at this time will kill the spores which are already present, but it will not destroy the fungus plant. The latter goes on producing fresh crops of spores every few weeks throughout the growing season. Only young growing tissues, however, are susceptible to the attacks of the fungus, so that it is usually unnecessary to continue spraying after the fruit is fully developed. Experience has shown that the disease is most effectively controlled by spraying at the following times: (1) three to four weeks after petal-fall, (2) three weeks later, (3) one month after (2), and then at monthly intervals until the fruit reaches maturity. In a dry season the first two sprays may be sufficient to control the disease, but in a wet season monthly treatments will probably be necessary.

Both Bordeaux mixture 4-4-100 and lime sulphur are effective in controlling this disease, but they may injure the fruits, particularly peaches. For this reason other sprays such as wettable sulphur (5 to 6 lb. to 100 gallons water) or dry-mix lime sulphur (20 lb. sulphur, 10 lb. hydrated lime plus 1¼ lb. dry calcium caseinate mixed to a paste and added to 100 gallons of water) or the various copper- or sulphur-containing proprietary mixtures are to be preferred. If lime sulphur is the only spray available, this should be diluted 1-200 to avoid damage. As a general precaution against spray injury in hot weather it is advisable to spray early in the morning or towards evening.

RECONSTRUCTION OF AGRICULTURE.

A limited number of copies of the " Report of the Reconstruction Committee of the Department of Agriculture and Forestry " *is still available. Applications for this Report, which is issued gratis, should be addressed to the Editor, Department of Agriculture and Forestry, Pretoria.*

Worms in Sheep, Goats and Cattle.

Different Types and Their Control.

Dr. H. O. Mönnig, Onderstepoort.

In the November issue there appeared the first portion of this article, namely, Chapters I and II in which liverflukes and tapeworms were discussed. A list was also given of the different kinds of worms which infest sheep, goats and cattle. Figures 1 to 10, which were given in the article referred to, may be consulted in connection with the third chapter below.

III. Round or Wireworms *(Nematoda)*.

Eyeworm.

Eyeworm (*Thelazia rhodesii*).—Under the eyelids of bovines thin round worms measuring about ½ inch in length are often found. Their life-cycle is unknown but it is probable that the eggs of the worms are eaten by cockroaches and dung-beetles and that the animal is infected when it happens to eat such beetles. The worms are not harmful and do not cause the ordinary eye-disease which occurs in cattle. (Fig. 11, 1).

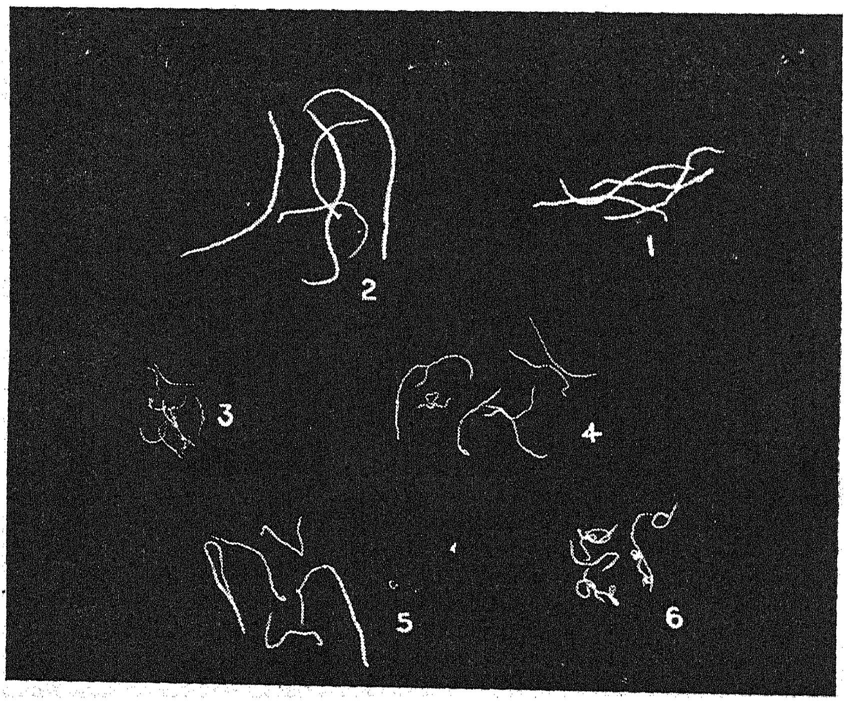


Fig. 11.—1, eye worm; 2, wireworm; 3, bankruptworm; 4, brown stomach worm; 5, long-necked bankruptworm; 6, Cooperia (natural size).

Setaria cervi.

Setaria cervi.—This is a thin white worm, about 3 inches long, which is sometimes found between the entrails in the stomach cavity of bovines. The worm is not harmful. Similar worms are often found in game.

Zigzag-worm.

Zigzag-worm (*Gongylonema*).—In the gullet of the sheep and of other animals, a long, thin worm is sometimes found, laced in a

zig-zag fashion in the mucous membrane. Similar worms, light-red and about 3 inches long, are also found in the rumen. These worms are harmless, but are sometimes mistaken for wireworms.

Wireworm.

Wireworm (*Haemonchus contortus*).—This is a thin worm about an inch long. (Fig. 11, 2). The male is smaller than the female, and light red, while the latter is red with white spiral stripes like a barber's pole. They live in the milk (fourth) stomach of sheep, goats, cattle and in many species of buck (game) and are sometimes confused with *Gongylonema* and the brown stomach worm (Fig. 11, 4).

These worms suck much blood, with the result that the sheep becomes anaemic—as is evidenced by the paleness of the membranes of its eyes and mouth—and weakens rapidly. The blood becomes watery, and watery swellings develop all over the body, so that the sheep has the appearance of being in good condition. When the milk stomach is opened, it is found to contain a reddish-brown mass (often mixed with sand) and wireworms.

Life-cycle.—The eggs of the wireworm are discharged on to the veld in the excreta of sheep, and when the weather is sufficiently warm and moist, they hatch, and the resulting young worms, after they have twice shed their skins, are ready to infect sheep. The rapidity of their development depends upon the heat; in summer, the eggs take 5-6 days to hatch and become infective, and in winter, a few weeks. It is only after the shedding of their second skins that the young worms are able to withstand drought. If they were to suffer drought before that time they would die—as would the eggs. It is, therefore, easily seen that the most favourable time for the worms is summer, while in winter hardly any eggs would develop unless they happened to be dropped in a vlei or at the edge of a dam, where the necessary moisture conditions are more or less permanent. These are always danger spots, as there the worms multiply rapidly.

After their second moult, the worms are approximately $^1/_{50}$ inch long. They are hardy and, consequently, able to live a long while even though they may finally be dried out completely. On the veld, they usually do not live longer than three months, but in a cool climate some may live even a year. Under ordinary conditions the majority of them, however, die fairly quickly, especially during the first 2 weeks. For this reason a system of rotational grazing, in which three camps are used so that each camp can be grazed for a week and rested for 2 weeks, will considerably alleviate the position. On the other hand the thorough cleaning of a camp is a difficult task, except during winter when the worms die as a result of prolonged drought. The only sources of infection remaining in the veld after winter are wet spots such as around dams or drinking troughs.

In dams, the young worms live about three months, but they lie in the mud at the bottom, as they are not able to swim upward in the water. In the case of a dam, the water itself thus harbours no serious danger, unless the animals stir the water before drinking. The vicinity of the dam, however, constitutes a most serious source of infection on account of the fact that this soil remains moist and the worms can thrive, while a few mouthfuls of grass are sufficient to cause serious infection in an animal.

When the grass is damp and the light not too strong, the worms crawl up the grass-blades and are swallowed by the animals. This mostly happens in summer, in the morning and in the evening, or when the sky is cloudy. In dry conditions, as in winter, or in bright sunlight, the worms crawl down and find shelter in dense grass near the ground. It is on this account that sheep eating

short grass near the ground are more heavily infected than cattle which cut the grass higher up. From the time they are swallowed by the animal it takes them three weeks to reach the adult stage, when they begin to lay eggs. Each female lays about 10,000 eggs per day, hence they propagate rapidly under favourable conditions. The worms do not live much longer than a year, in isolated cases perhaps two years.

Control.—Wireworms are killed by means of nodular worm remedy, a blue vitriol-nicotine mixture and Tetram. Further particulars as regards the use of these remedies are given later in this article. As long as the veld remains green, sheep and goats should be treated every three weeks with a view to killing the worms before they can deposit their eggs. It is also desirable to treat cattle regularly. In a very wet summer the worm multiplies so rapidly that the sheep cannot be left untreated for three weeks and must be dosed every two weeks. General remedial measures are as described lower down.

The Brown Stomach Worm.

The brown stomach worm (*Ostertagia*) (Fig. 11, 4) also lives in the milk (fourth) stomach of sheep, goats, cattle and buck (game). It is dark-brown and considerably finer and smaller than the wireworm. It is sometimes difficult to distinguish brown stomach worms from young wireworms.

These worms cause the same symptoms as wireworms, and their life-cycle is identical with that of the wireworm.

Control.—General remedial measures will be described later. Tetram is recommended.

The Bankrupt Worm.

The bankrupt worm (*Trichostrongylus*) (Fig. 11, 3) is a fine small worm about ¼ inch long, which lives chiefly in the small intestine immediately behind the milk stomach and sometimes also in the latter. To see these worms, it is necessary to scrape off some of the mucous membrane from the inside of the intestine and smear this on a piece of glass, which can be held against the light. The name bankrupt worm is often applied to the "knoppies" or nodular worm (Fig 12, 3), but the two are not the same. Persian sheep and Angora goats are, in this instance, more susceptible to infection than merinos. In the ordinary course, merinos in good condition and free from other worms do not become badly infected, but the bankrupt worm can be the cause of trouble in merino lambs.

Experience has shown that the bankrupt worm is the most dangerous worm parasite in Persian sheep. The worms suck the blood and sap the health of the sheep which loses condition and dies.

Life-cycle.—This is similar to that of the wireworm with one important exception, namely that eggs which are ready for hatching are most resistant and capable of enduring the most severe drought for many months. Consequently, we find numerous eggs of bankrupt worm distributed over the veld during winter. The faeces of the animal contain just sufficient moisture for the protection of the egg until it is in a condition to hatch. If the egg is not wet enough, it remains in the veld without losing its hatchability. In this manner a very large infection may accumulate. After the first rains have fallen the eggs all hatch and the sheep are again severely infected. If persian sheep are severely infected purging occurs and the animals become lame; such sheep may be in excellent condition and yet die within a few days.

Control.—The general remedial measures will be described later. Remedies containing arsenic (not nodular worm

remedy) are dangerous in the case of severe bankrupt worm infestation. For treatment blue vitriol-nicotine mixture is fairly effective, but Tetram is better.

Cooperia.

Cooperia (Fig. 11, 6).—A kind of bankrupt worm, which is just perceptible to the eye, occurs especially in the small intestine of cattle. The worms are usually curled up and have a slightly red colour. They are most injurious. Their life-cycle corresponds to that of the wireworm. Tetram is an effective remedy and blue vitriol-nicotine mixture also gives fairly good results.

The Long-necked Bankruptworm.

Long-necked bankrupt worm (*Nematodirus*) (Fig. 11, 5).—This is a small red worm which inhabits the small intestine of sheep and

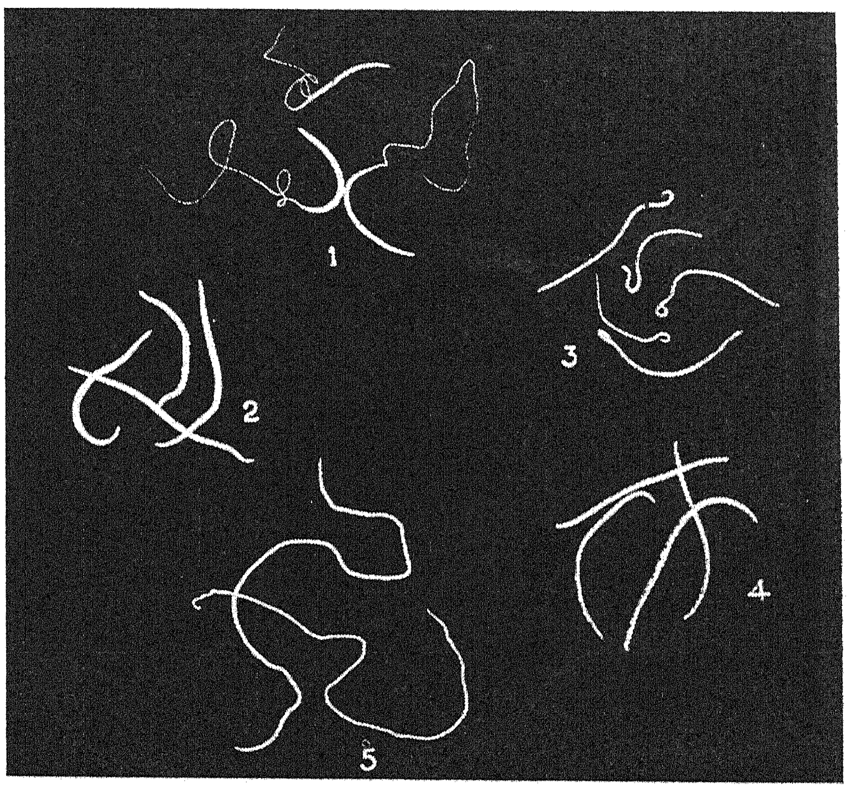


Fig. 12.—1, whipworm; 2, hookworm; 3, nodular worm; 4, large-mouthed worm; 5, lungworm (natural size).

goats and sometimes also those of cattle and game. The worms can be detected fairly readily with the eye. They are blood suckers and cause anaemia, but are not very harmful unless they occur in large numbers.

This parasite is confined almost exclusively to the Karoo where it plays an important rôle in that it undermines the health of sheep and thus renders the animals more susceptible to wire- and nodular worm infection.

Control.—The general remedial measures are as described below. Tetram is an effective remedy.

Hookworms.

Hookworms.—Of these, three species are known in South Africa, namely, two which live in sheep and goats and one which occurs in bovines.

Gaigeria pachyscelis, the sandveld hookworm, is found in sheep and goats in the fairly dry sandveld regions of the western Tranvaal, the western Free State and the northern areas of the Cape Province, Bechuanaland and South West Africa. It is the most deadly of sheep worms.

The grassveld hookworm, *Bunostomum trigonocephalum*, lives in sheep and goats and the grassveld hookworm *B. phlebotomum* in cattle in the grassveld areas of the Union where the climate is fairly wet.

The hookworms (Fig. 12, 2) are about an inch long, fairly thick and of a grey-yellowish colour. They live in the small intestine. They attach themselves to the intestines by biting with the object of sucking blood; a large number of small wounds can be seen in the inside of the intestines where they have bitten. The worms suck much blood and cause considerable loss of blood which very soon results in anaemia. The membranes of the animal's eye and mouth become pale and more often than not a watery swelling is formed below the jaw and the animal becomes weak. The blood of such an animal is watery, the body cavities containing much water. The faeces of the animal are often darkened with blood and may also have a thin, tarry consistency. Sometimes sheep die which appear to be fat.

Life-cycle.—The life-cycle of these worms is similar to that of the wireworm, but the young worms are not capable of resisting drought under veld conditions. Consequently these parasites occur only on wet spots. Animals are infected through the skin of their trotters, which is penetrated by the worm. It is also possible that grassveld hookworms may be swallowed with grass, but *Gaigeria* penetrates the skin only. In these circumstances it is understandable that the mud round dams and pans containing water and round drinking troughs is the most dangerous source of infection. It is also possible that infection may take place in kraals where manure accumulates and remains wet.

Control.—For treatment Tetram is effective. The hookworm harbours in the animal for a few years and keep the infection active. The most suitable time for treating the animals is during winter when the worms in the veld die out. Moreover, animals should be kept away from dams and pans and be allowed to drink from good drinking troughs only. Gravel should be spread round the drinking troughs and, should any dampness remain, salt may be sprinkled to kill the young worms. As soon as manure in the kraal accumulates and remains damp, it should be removed.

Furthermore, the animal should be fed a lick containing green vitriol such as described for the treatment of liverfluke, as a remedy against anaemia.

Ascaris vitulorum.

Ascaris vitulorum occurs in the small intestine of calves. It is a large worm, 6-10 inches long and as thick as a lead pencil. Infected calves become anaemic, their coat is staring and they may even purge.

The worms lay vast numbers of eggs which are discharged with the faeces. In about a week's time small worms develop from the eggs. The eggs, which are very resistant, remain in the veld unchanged and may live for a few years. Calves are infected by ingesting the eggs.

Control.—The infection usually occurs in stables and calf pens where the eggs accumulate. For this reason, calves should be kept in such places as little as possible. Clean the stable and

pens regularly and see to it that the calves receive clean water and clean feed. By way of treatment, nodular worm remedy or blue vitriol-nicotine mixture may be used.

The Nodular Worm.

The nodular worm (*Oesophagostomum columbianum*) (Fig 12, 3) is a stiff, white worm, about 1 inch long, and lives in the large intestine, especially between the blind gut and the spiral gut of sheep, goats and some buck (game). In bovines a different species occurs, namely *Oesophagostomum radiatum*.

The worms do not suck blood, but live on the mucus secreted by the intestine. They exude substances that are poisonous to the sheep, causing it to become emaciated and weak. Anaemia is not present to any appreciable extent, and in this respect sheep infected with nodular worm differ from those infected with wireworm and other worms.

The life-cycle is similar to that of the wireworm, but when the sheep becomes infected, the young worms first burrow into the wall of the gut and live there for a time, with the result that the characteristic nodules are formed in the gut. When the worms again emerge from the nodules into the intestinal cavity, they cause the dark-green diarrhoeal excrement that is often seen in lambs. Later, when the worms develop in the large intestine, the sheep frequently suffers alternately from constipation and diarrhoea. Approximately six weeks after infection the first eggs are passed in the sheep's faeces.

Control.—For treatment of sheep and goats, nodular worm remedy is recommended. Further particulars are given later. In the case of cattle, the nodular worm is not very injurious. As a rule infected cattle also harbour wireworms and other worms and if they are treated for these infections they are also freed from the nodular worms.

The Whipworm.

The whipworm (*Trichuris*) (Fig. 12, 1) is a thick worm with a long, thin neck and lives in the blind gut of sheep. It is practically harmless, and the only reason for mentioning it here is that it may be confused with the nodular worm.

The Large-mouthed Worm.

The large mouthed worm (*Chabertia ovina*) (Fig. 12, 4) closely resembles the nodular worm but usually is of a more pronounced grey colour and lives further to the back, especially in the spiral gut of sheep, goats and bovines. The worm seldom occurs in the Union and has so far only been discovered in the winter-rainfall area, especially in the region of Bredasdorp and Caledon. The worm has a large mouth and attaches itself to the gut, where it sucks blood.

Life-cycle.—This corresponds to that of the wireworm.

Control.—Treat with Tetram and apply general measures as will be described later.

Large Lungworms.

Large lungworms.—The large lungworm (*Dictyocaulus filaria*) (Fig. 12, 5) occurs in sheep and goats, whilst another species (*Dictyocaulus viviparus*) are found in bovines. They are white worms, which measure 2-3 inches in length and harbour in the bronchial tubes. They cause inflammation of the bronchial tube, as a result of which the infected animals breathe with difficulty, emaciate and become weak; viscid mucus is expelled through the nostrils as a result of coughing. (The nasal worm of sheep—which really is no worm but the larva of the nasal fly—also causes the expulsion of copious mucus through the nose.)

Life-cycle.—The eggs of the worms are swallowed together with the mucus and hatch in the intestines, so that small worms are passed in the faeces. They can survive only in damp places and are able to cause re-infection of animals ingesting them with grass and water after about a week.

Control.—There are no known effective remedies for lungworms. The animals are infected only on wet, marshy places, from which they should be removed. As a rule such animals are also heavily infected with other worms for which they should be treated. If the animals are well fed and protected from cold, they usually recuperate soon, even when they are not treated, since the lungworms do not live long.

The Small Lungworm.

The small lungworm (*Muellerius capillaris*) is a parasite which lives in sheep and goats. The infection was introduced into the Union as a result of the importation of mutton-breeds of sheep, and heavy losses in such sheep were sustained. The worms are very small and live in the lungs, where they cause the development of grey nodules. The infected animals gradually emaciate, usually develop a cough and eventually die.

Life-cycle.—In this case too, small worms are passed in the faeces of the animal. These small worms can only develop further if they find a snail into which they can penetrate. Numerous species of slugs and snails are suitable. The infected slugs or snails are then swallowed by sheep which happen to graze on infected places and are then infected.

Control.—No remedial measure is known. Remove the animals from damp grazing where snails occur.

General Control Measures.

1. *Feeds and licks.*—Animals which for some reason or other have become weak, for example as a result of insufficient feeding, are most susceptible to worm infection and usually suffer more as a result of this condition than other animals.

One of the most important remedial measures against worms is proper feeding and the supplementing of mineral deficiencies by means of licks. Animals should be well fed, especially during winter, so that they may be resistant to worm infection during the following summer. The problem of supplying winter feeds is also of the utmost importance in connection with the following point.

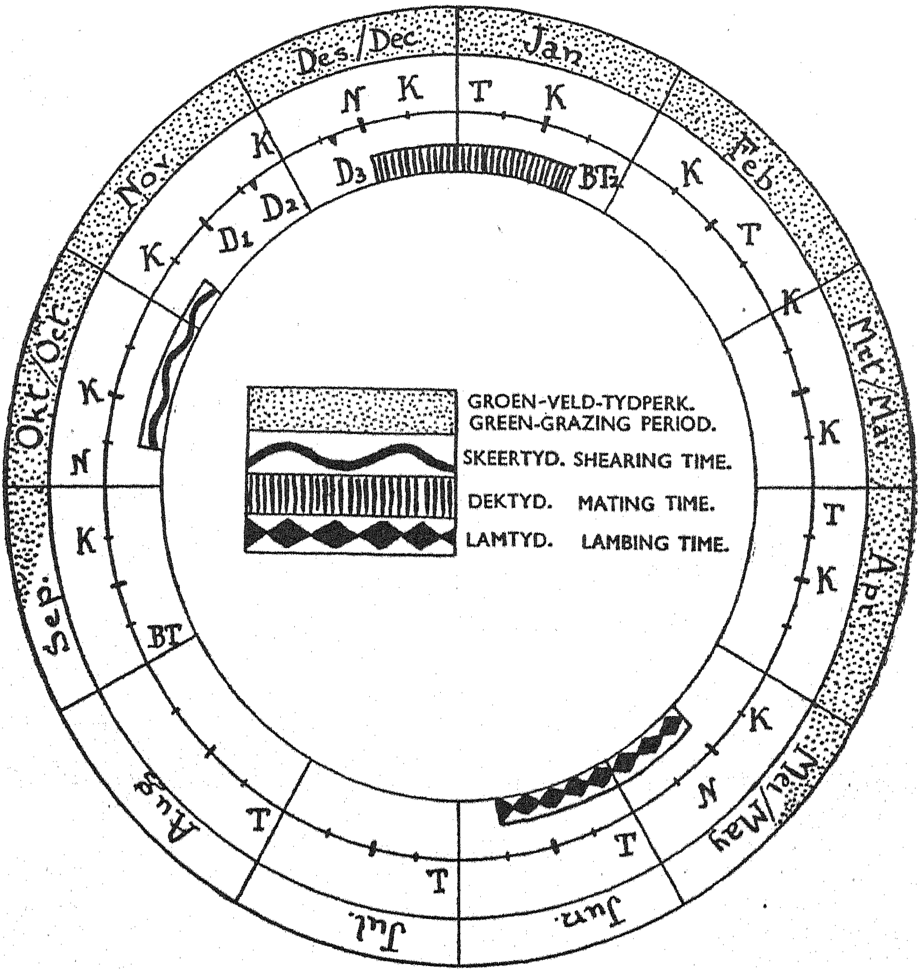
2. *The right lambing season.*—It is a known fact that lambs and calves are much more susceptible to worm infection than older animals. Consequently they require more care. Lambs born in September begin to graze at a time when the worm infestation commences, whereas a lamb born in May starts to nibble at a time when winter conditions eliminate worm infection to a large extent. In these circumstances the best lambing season falls in about May, or in those areas where cold is not very severe, even later. The lamb should be weaned in September and removed from the ewes whilst the veld is still dry, and run separately in a paddock where no older animals can infest their grazing. In this way the lambs get a good opportunity of starting life without worms.

In order to ensure such a condition the farmer should make provision for winter feeds for his ewes with lamb at foot and young lambs and again for the same lambs a year later when they will be shedding teeth. In this way he will also ensure that the ewes are in good condition when they are mated the following December.

3. *Overstocking and rotational grazing.*—The more animals are run on a particular piece of veld, the quicker will worm infection

increase. If the number of animals running on the veld is too large the veld is grazed down and trampled, with the result that it does not produce sufficient feed and that the danger of worm infection is further increased. Overstocking and continuous grazing of a camp thus lead to worm trouble. As has already been indicated in connection with the life-cycle of wireworms, rotational grazing does much towards the prevention of infestation—a method of control which also applies to worms of other species. The three-camp system, according to which each camp is severely grazed for a week and then rested for 2 weeks has many advantages. The area of the three camps together need not be larger than one camp which can carry the number of animals in question.

4. *Water*.—As has already been indicated under the life-cycle of the various species of worms, all species require moisture for their development and existence outside the body of an animal. Dams



Calendar.

K.—Treatment with Nodular Worm Remedy.
T.—Treatment with Tetram (or blue vitriol-nicotine mixture).
N.—Treatment for nasal worm, where necessary.
BT.—Inoculation against blue-tongue and, where the disease is severe, a second treatment as indicated by BT_2.
D.—Dip for keds three times at intervals of 10 and 14 days.

and pans containing water and, naturally also vleis and streams, are dangerous since there is always damp soil on which grass grows in their vicinity and each worm egg falling into such water has the best chances for development and continuing the infestation. Young hookworms live long in mud and infect animals which trample in it by penetrating the skin of the trotters.

In these circumstances animals should be kept away from such places and drink water out of good troughs. The water of a dam may be used if it is conducted to the drinking trough by means of a pipe, but the pipe should not touch mud. Further particulars have already been discussed under wireworms and hookworms.

In this connection it may be added that the young worms which occur in the veld, water or mud, are very small and cannot be seen with the naked eye. The worms which can be seen in drinking troughs or in mud, are usually larvae of certain gnats, or earthworms, and have nothing to do with worm parasites of animals.

5. *Treatment.*—It does not pay to dose animals showing signs of worm infection indiscriminately with some remedy or other and to repeat the treatment every now and then when the animals do not look well. Each worm remedy has a specific reaction against definite species of worms and it is necessary to determine first which species are present and then to use the right vermicide. Moreover, it is entirely wrong to wait until the animal does not look well, for by then the worms have already done much harm and laid millions of eggs as a result of which the veld has become severely infested. The female of a wireworm lays about ten thousand eggs per day and that of a nodular worm about seven thousand. In treating animals for worms the object should be to remove the source of infection, so that the animals may not infest the veld. Such treatment should be given early and the right remedies should be used.

Animals should be treated for liverfluke when the necessity arises, as already discussed. For certain species of worms, especially lungworms, no remedy has been discovered as yet. For other worms the following remedies are recommended:—

(1) *Nodular worm remedy* (N.W.R.) against wireworm, tapeworm and nodular worm.

(2) *Tetram* against all worms in the abomasum and the small intestine.

(3) *Blue vitriol-nicotine mixture* (B.N. mixture) against wireworm, bankrupt worm and tapeworm.

N.W.R. and Tetram are supplied by the Division of Veterinary Services together with full directions.

B.N. mixture is prepared as follows:—

1 oz. (by weight) blue vitriol, 1 oz. (1 liquid oz. = 30 c.c.) tobacco extract containing 40 per cent. nicotine, 3 pints of water. Prepare the mixture in an enamel or earthenware container or pail. The mixture may be kept for a long period in bottles. It is administered to sheep and goats in the following doses:—

1-3 months old, ¾ oz.; 4-6 months old, 1 oz.; 7-12 months old, 1½ oz.; over 12 months, 2 oz. Young cattle are dosed at 1 oz. per 50 lb. live weight but not more than 3 oz.; fully grown cattle receive 4-5 oz.

A Dosing Time-table.

In the accompanying calendar recommendations are made as to how these remedies should be used for sheep. Regular treatment with N.W.R. as long as the veld remains green is usually sufficient for controlling wire-, tape- and nodular worms. It is particularly

important to commence the treatment early in spring and clean the sheep of worms which have emerged during winter from nodules in the gut and have reached the adult stage, so that their eggs may not infest the veld. After regular treament for about 18 months nodular worm will no longer constitute a pest, but this requires regular and continuous treatment.

N.W.R. alone, however, is not sufficient for the following two reasons:—

(1) It does not kill certain worms, especially not the hook-, and bankrupt worms, so that the administration of another remedy is essential. Tetram is the best suited to this purpose, but in those cases, where hook or long-necked bankrupt worms are not present B.N. mixture may be used. As indicated in the calendar the mixture is dosed particularly during winter and regular treatments with N.W.R. are applied in between a few times during summer.

(2) The large quantity of blood which enters the abomasum as a result of attacks by wireworm, the small intestine as a result of attacks by hookworm, contains iron which neutralizes the effect of N.W.R. If wireworm infection is very severe or the hookworm population very large, N.W.R. does not act as favourably as otherwise and another remedy which can eliminate the worms has to be administered.

It is not necessary to keep the animals away from food and water before administering the remedies. It is even dangerous to starve animals before treating them with N.W.R. If a sheep, goat or bovine is kept away from food, its abomasum gets empty. The remedies are administered in such a manner that they find their way to the abomasum direct. If the abomasum is empty, it may be seriously harmed by the remedy which remains inactive until the animal commences to feed and the remedy is thus pushed on by the food. Such a procedure is most undesirable and dangerous. Lambs and calves, however, should not have any milk in their stomach when they are treated and should not be allowed to suckle 4 hours prior to and 2 hours after the treatment. They may, however, be allowed to graze and drink water.

The animals should, however, not be allowed access to water for about an hour after treatment, else the remedy will be diluted and become ineffective.

The reason for dosing sheep and goats with vitriol water and cattle with salt water before administering certain remedies is often not well understood and consequently wrongly carried out. In figure 1 the oesophageal groove is indicated. It consists of a double fold in the stomach of the animal by which entrance to the rumen may be shut off so that the gullet can be connected with the abomasum. The fold is controlled by nerves which can be stimulated in the mouth of the animal. Consequently, no more is required than to wet the mouth of the animal with a stimulant; the stimulant itself need not be swallowed. A small quantity is sufficient but the concentration is important. The older the animal or the poorer its condition, the more inert are its nerves and consequently the more concentrated the stimulant should be. A solution of ten per cent. is effective for all animals and is thus recommended. If the stimulant is diluted below this strength, heavily infested animals which need the treatment most, will not swallow it in the correct manner. In the case of sheep and goats blue vitriol should be used and in that of bovines about half a cup of ordinary salt water. The worm remedy is administered immediately without waiting until the animal swallows the stimulant, for the nerves act quickly. If one first

waits until the animal has swallowed, such an animal will inhale through its mouth at the very time when the remedy is dosed and in such a case, the danger exists that the animal may draw it into its lungs.

The stimulant must definitely be given, otherwise the worm remedy enters the rumen of the animal where it is mixed with a large quantity of food, with the result that it cannot have the right effect.

Phenothiazine is a new remedy which is effective against most worms living in the abomasum and intestines of sheep, goats and cattle but which does not effect tapeworms and the long-necked bankrupt worm. The remedy is expensive, however, (£1. 10s. 0d. or more for a single treatment of 100 sheep) and if it is spilled on or comes into contact with the wool when the animal wets itself it may impart a permanent red colour to the wool, rendering it unsuitable for general use. It may be a good practice to apply a single treatment with this remedy at the end of winter and to clean the animals properly in order to avoid infestation of the veld.

Are Fertilizers a Danger?

[*Continued from page 744.*

the correct use of superphosphate, mixed fertilizers, rock phosphate and agricultural lime, as well as on the making and use of farmyard manure and farm compost. Whenever unknown and untried materials are offered to farmers as fertilizers or manures, it is important that they should first consult the Department before buying material which may prove to be quite worthless.

(Dr. J. P. van Zyl, Chief, Division of Chemical Services and Controller of Fertilizers.)

Save Transport.

Tyres and speeding:—Everyone knows, or should know, that wear and tear on tyres and petrol consumption greatly increase with extra speed. Excessive speed is not a common fault among motorists to-day because they know that it burns up their almost irreplaceable tyres. Nevertheless, cars are sometimes overturned and wrecked as the result of speeding. That sort of thing is little short of sabotage.

The carburettor:—Unless you really know what you're about, don't tinker with the carburettor in an effort to increase mileage. The amateur, who is often ignorant of the principles governing the operation of his own particular carburettor, usually contents himself with weakening the main jet mixture, unmindful of the fact that it is also necessary to alter most of the carburettor settings in order to balance the mixture and to ensure accurate carburetion at all throttle openings. There is little advantage in weakening the main jet mixture if the compensating and low-speed jets are left over-rich. If you feel that you are justified in expecting a higher mileage, consult your garage.

SOWING CHART FOR FIELD CROPS.

The Sowing Chart for Field Crops for the Union is again obtainable at 3d. per copy, from the Editor of Publications, Department of Agriculture, Pretoria.

Tobacco Extract for Control of Arsenic-Resistant Blue Tick* and Cattle Lice.

P. M. Bekker, Division of Veterinary Services, Onderstepoort.

A strain of the blue tick, *Boophilus decoloratus*, has made its appearance in the East London area. In outward appearance, life cycle and habits, it does not differ from the ordinary tick and yet it cannot effectively be controlled by means of arsenical dips. In other parts of the country the blue tick can still be effectively controlled by these means. The tick lives on one host, i.e. it passes all the stages of development on one and the same

FIG. 1.—A cow severely infected with ticks.

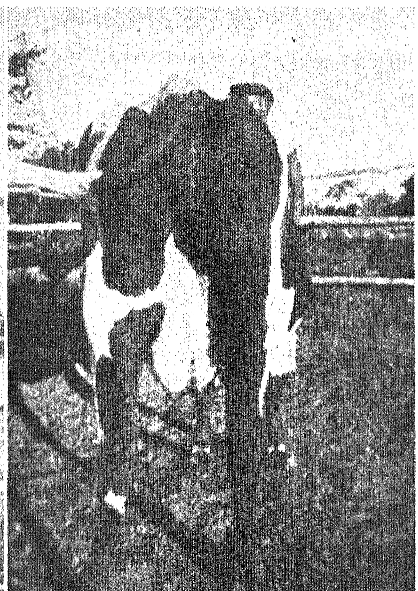


FIG. 2.—The same cow 10 weeks later.

animal. All other species of ticks are effectively controlled everywhere by means of the ordinary arsenical dip. No fault can be found with the dip; one need only ensure that the strength of the dip, as determined by means of the iodometer dip tester is correct. As regards the East London strain of the blue tick, mention should, however, be made of the fact that it has been proved by experiment that it does not help to increase the strength of the dip even to a fourteenday or greater strength and at the same time decrease the intervals, even to three days, in order to try to control this tick.

Although this tick, as far as could be ascertained, first made its appearance in this area, it could be clearly established how it spread from one farm to the other and from the one district to the other. The most noticeable distribution is apparently only along

* An article dealing with this subject appeared in "The Journal of the South African Veterinary Medical Association", Vol. XII (2), p. 50-58, 1941.

the coast. It has already passed Grahamtown on the one side and gone upwards all along the coast past Port Shepstone and the coastal area of Natal up to Ubombo on the otherside. It is difficult to say what distance the tick will spread to the interior; there are indications that at present it is found at the utmost from 80 to 100 miles from the coast.

Whatever the ultimate distribution may be, one thing is certain, viz., that, wherever the tick makes its appearance, steps should immediately be taken to control it effectively, since, apart from the irritation and loss of blood, which will naturally have a very detrimental effect on the animal's constitution, the tick is also a carrier of diseases such as redwater and gallsickness.

Extensive experiments have revealed that it is possible to control the tick concerned effectively provided nicotine is added to the ordinary seven-day arsenical dip to give a nicotine content of at least 0·04 per cent. Dipping should also take place regularly every week, for even if dipped every fortnight in the correct nicotine-arsenical strength, the tick still flourishes and cannot be checked.

Even if dipped in the correct strength and at the required weekly intervals, the tick does not disappear as if by magic, and cases may still occur where the animals are only entirely free from the adult and engorged resistant blue tick after the seventh dipping.

It obviously serves no purpose to add anything which has already been tested and found useless. Consult the Director of Veterinary Service before going to unnecessary expense. One type of addition must be mentioned, however, and that is paraffin and power paraffin (including crude oil and dieseline used as fuel). Both have been tested out in a concentration of as high as 2 gallons per 100 gallons arsenical dip in the tank. In spite of the presence of the paraffin as a perfect emulsion, it obviously had no effect on the blue tick, which is resistant to arsenic.

The illustrations give only a vague idea of the severity of the infestation, since only the engorged ticks are visible and not the thousands of little ones. At the same time they reveal that the tick can be killed if nicotine is added to the arsenical dip. The cow has been regularly dipped in an arsenical liquid containing 0·16 per cent As_2O_3. She has a white udder, so thickly covered with small ticks that it appears black. The illustration on the right shows the same animal after she has been dipped for about 10 weeks in an arsenic-nicotine mixture, as recommended. Here her tick-free udder is white.

Source of Nicotine for Dipping Purposes.

The sole source of the nicotine is, of course, tobacco. It is manufactured and sold as tobacco extract, which usually contains 40 per cent nicotine in the form of nicotine sulphate.

As a result of the scarcity and exceptionally high price of 40 per cent nicotine, a method has been devised by which the farmer can make his own nicotine by leaching tobacco in the dipping tank itself. Particulars of this method, which appeared in the November 1942 issue of *Farming in South Africa* under the heading "Use of Waste Tobacco in Dips", are obtainable from the Director of Veterinary Services, P.O. Onderstepoort.

Nature of 40 Per Cent. Nicotine.

The strength of the nicotine sulphate, or tobacco extract as it is generally known, is given in terms of nicotine, viz. 40 per cent. This signifies that 100 lb. by weight of the tobacco extract contains

40 lb. nicotine. If the strength is given in terms of weight per volume, as is customary in the case of dips, it would mean that 10 pounds of nicotine is less than 1 gallon, since nicotine is heavier than water and 1 gallon of water weighs exactly 10 lb. A 10 lb. tin of nicotine therefore contains less than 1 gallon. The volume is actually about 7 pints instead of 8.

Use of Nicotine in Dipping Tanks.

The following dilutions are recommended to make provision for the nature of the water and for the natural decrease in strength of the nicotine in the course of time.

Preparing Fresh Dip.

40 *per cent Nicotine*.—To obtain the correct 0·04 per cent nicotine when mixing fresh dip, the following dilution should be made: 10 lb. nicotine of 40 per cent strength to every 800 gallons arsenical dip of 7-day strength in the tank. If the arsenical dip is too dirty, however, it is advisable first to clean the tank and to fill it with fresh dip of a strength of 2 lb. sodium arsenite (arsenite of soda) dissolved in boiling water for every 100 gallons of water in the tank. The correct quantity of nicotine is then added to this as indicated above.

Adding Dip at a Later Stage.

If arsenical dip is to be added later, 1 pint of nicotine should be added for every 2 lb. sodium arsenite added (i.e. for every 100 gallons water). For every 14 lb. sodium arsenite (700 gallons water) the whole 10-lb. tin of 40 per cent nicotine should, therefore, be added.

95 *per cent Nicotine*.—In case the nicotine alkaloid, which contains 95 per cent nicotine, is available, the dilution required when mixing fresh dip is 1 gallon (8 pints) to 1,900 gallons water (i.e. 1 pint to 240 gallons). If dip is added later, the dilution should be half a pint for every 100 gallons of water and 2 lb. sodium arsenite added.

It may be mentioned here that while 10 lb. of the 40 per cent nicotine is only equal to 7 pints, as has already been mentioned, the volume of 10 lb. of the alkaloid with 95 per cent nicotine, equals 8 pints or one gallon. It is, therefore, supplied in quantities of 1 gallon, if available.

Indirect Field Control of Nicotine Content.

No field tester exists at present to determine the nicotine strength of a dip, and for this purpose we indirectly use only the arsenite tester (iodometer) as follows:—Assuming that when mixing fresh dip we add 10 lb. (7 pints) of 40 per cent. nicotine for every 16 lb. sodium arsenite (quantity required for 800 gallons of water) in the tank, and assuming futher that a subsequent test with the iodometer dip tester reveals a too low arsenic value and that more sodium arsenite should, therefore, be added, then, besides the arsenite, 1 pint of nicotine for every 2 lb. sodium arsenite is also added. In this way the strength of the dip can be regulated very accurately, provided great care is taken that the corresponding quantities of sodium arsenite and nicotine are always added.

Table of Quantities of 40 Per Cent. Nicotine to be Added when Mixing Fresh Dip.

The dilution when fresh dip is mixed is 10 lb. 40 per cent nicotine to 800 gallons, i.e. 1¼ lb. nicotine for every 100 gallons of dip of 7-day strength in the tank.

The following quantities of nicotine are required for tanks of the various capacities given:—

Capacity of dipping tank.	Quantity of 40 per cent. nicotine required when fresh dip is mixed (10-lb. nicotine equals approx. 7 pints.)
2,400 gallons	Three 10-lb. tins, i.e., 30-lb. or approx. 21 pints.
2,800 gallons	30 10-lb. tins, 35-lb. or 24¼ pints.
3,000 gallons	37½ lb. or 26¼ pints.
3,100 gallons	38¾ lb. or 27 pints.
3,200 gallons	40 lb. or 28 pints.
3,300 gallons	41¼ lb. or 29 pints.
3,400 gallons	42½ lb. or 30 pints.
3,500 gallons	43¾ lb. or 31 pints.
3,600 gallons	45 lb. or 31½ pints.
3,700 gallons	46¼ lb. or 32½ pints.
3,800 gallons	47½ lb. or 33¼ pints.
3,900 gallons	48¾ lb. or 34 pints.
4,000 gallons	50 lb. or 35 pints.
4,100 gallons	51¼ lb. or 36 pints.
4,200 gallons	52½ lb. or 37 pints.
4,300 gallons	53¾ lb. or 38 pints.
4,400 gallons	55 lb. or 38½ pints.
4,500 gallons	56¼ lb. or 39½ pints.

If water and dip are added later, 1 pint of nicotine and 2 lb. sodium arsenite for every 100 gallons of water should, as has already been explained, be added.

Correction Table for Adjusting the Strength of the Weakened Dip.

Assuming that a chemical analysis of the dip in the tank reveals that, although the arsenical value is correct, the nicotine is for some reason or other weaker than the 0·04 per cent strength, then it can be adjusted as follows:—

Strength of Dip % Nicotine.	Quantity, in fluid ounces, to be added per 100 gallons weakened dip, if use is made of:—	
	40 per cent. Nicotine.	95 per cent Nicotine (alkaloid).
Nil	10-lb. or 7 pints to 800 gallons.	1 gallon (8 pints) to 1,900 gallons.
0·010	15 fluid ounces to 100 gallons of dip.	7½ fluid ounces to 100 gallons of dip.
0·015	12½ „ „	6¼ „ „
0·020	10 „ „	5 „ „
0·025	7½ „ „	3¾ „ „
0·030	5 „ „	2½ „ „
0·031	4½ „ „	2¼ „ „
0·032	4 „ „	2 „ „
0·033	3½ „ „	1¾ „ „
0·034	3 „ „	1½ „ „
0·035	2½ „ „	1¼ „ „
0·036	2 „ „	1 „ „
0·037	1½ „ „	¾ „ „
0·038	1 „ „	½ „ „
0·039	½ „ „	¼ „ „
0·040	Correct strength.	

This table was drawn up on the basis of a dilution of 1 to 700. According to these figures ½ fluid ounce of 40 per cent nicotine should be added per 100 gallons weakened dip for every 0·001 the reading is too low.

If the 95 per cent nicotine (alkaloid) is used, only ¼ fluid ounce need be added per 100 gallons for every 0·001 the dip is too weak.

Corrections to be Made if the Concentration is Too High.

If the chemical analysis reveals that the nicotine strength is too high, 2½ gallons of water should be added per 100 gallons of dip for every 0·001 the reading is higher than 0·050. For concentrations of 0·04 to 0·05 nothing is added.

Samples for Analysis.

It is important that animals should be dipped in liquid of the correct strength, otherwise all the trouble and expense will be in vain. If care is taken, however, that for every 2 lb. sodium arsenite (quantity required for 100 gallons of water) added to, or originally present in, the dipping tank, the correct quantity of nicotine is added, then the dip ought to be of the correct strength. To make quite sure, however, that everything is in order, a sample of the dip can be sent every few months for analysis (free of charge) to the Director of Veterinary Services, P.O. Onderstepoort. A quarter (200 c.c.) to half a bottle (375 c.c.) will suffice. As soon as the sample has been taken, three finely powdered acid tablets (red dip tester tablets) must be added. Only after all the gas has escaped from the bottle, it should be corked, well packed and despatched.

Effect of Nicotine on Animals.

The results of experiments to be published later, will show that over a period of three years there is no noticeable difference between animals regularly dipped in an arsenic dip and those regularly dipped in an arsenic-nicotine mixture. Especially the milk production of the cows and the condition of the adult animals and of the calves which have been dipped from birth, have borne this out.

It is interesting to note that the animals' eyes smart from the nicotine dip, with the result that they close their eyes tightly when they emerge from the dip and run into any obstacle. This lasts only about a minute and after that the eyes run heavily for a while. The smarting has no detrimental effect, however. Care should, therefore, be taken that the enclosure of the draining pen is well constructed of poles and not of wire.

If an arsenical dip is used, it is desirable to dip early in the morning when the air is still cool. The animals should not be driven immediately before or after dipping, nor be dipped when it is raining. Dipping should preferably not take place on hot, sultry days; in other words, unfavourable weather conditions should be avoided as far as possible. The same remarks apply when animals are dipped in an arsenic-nicotine mixture, but if the ordinary precautions are taken, the dip is no more detrimental nor has it any worse effect on the animal than the ordinary arsenic dip.

Lice on Cattle.

It is a well-known fact that the red biting louse is killed by ordinary arsenical dip, but not so the blue or sucking louse. When lice are mentioned, therefore, the latter are meant.

Derris extract (rotenone or tuba toxin) is generally used, 1 gallon of which is added to 1,000 gallons of arsenical dip. Since the special lice preparation which comes mainly from the South Sea

Islands, is not obtainable at present, nicotine may just as well be used, as it is equally effective in the control of lice.

The 40 per cent nicotine is also used in a dilution of 1 to 1,000; i.e. one 10 lb. tin for every 1,000 gallons arsenical dip of 7-day strength. One addition is sufficient.

The Lament of a Soil Particle:— [*Continued from page* 742.

How does this faulty grazing management affect us—the soil-particle tenants? When the grass commences to fail in health it becomes impossible for our houses to be kept in repair. Leakage through the grass walls and roofs becomes excessive and we are unable to conserve all the rainwater where it falls, with the result that our landlord receives less rent in the form of water for his sustenance, and his condition steadily becomes critical.

The climax now approaches rapidly. Our only remaining protection is the humus carpet, but this is also steadily washed away by the water which we no longer have enough time to conserve, and our exposure is such that the death of the grass is inevitable.

The final act of the tragedy is now staged: with the landlord dead and our humus carpet gone, our exposure to the full force of the rain is complete, and ejection or death soon stares us in the face.

Our capacity for storing water in the interstices between the multitudes of soil particles still exists, but the rush of the water over the soil surface during rain is now so swift, due to the death of the grass and the absence of the humus carpet, that insufficient time is provided to permit our underground reservoirs to fill.

Eventually our last efforts are nullified, and any supply to these vast reservoirs is prevented by the further destructive action of the rain. The raindrops now bombard us with such force that our ideal partnership of soil and sand is dissolved, and many of us are ejected from our homes, because, with our disintegration, mud and sand result. The mud is washed into the voids between us and seals them so efficiently that water conservation in and under them is impossible. The rainwater now runs off the soil surface totally uncontrolled, causing our death during its journey and leaving destruction and desolation in its wake.

Through no fault of their own, but owing to the recklessness of *man*, the upper soil particles are ejected from their homes because of their inability to pay the rent, while the lower soil particles lie dead and buried under a shroud of mud.

Grass, our landlord, is the basic sustenance of man and beast, so that, if this and succeeding generations are to survive, we, the soil particles, must pay him his rent regularly and in full—not in currency, but in rainwater conserved where it falls.

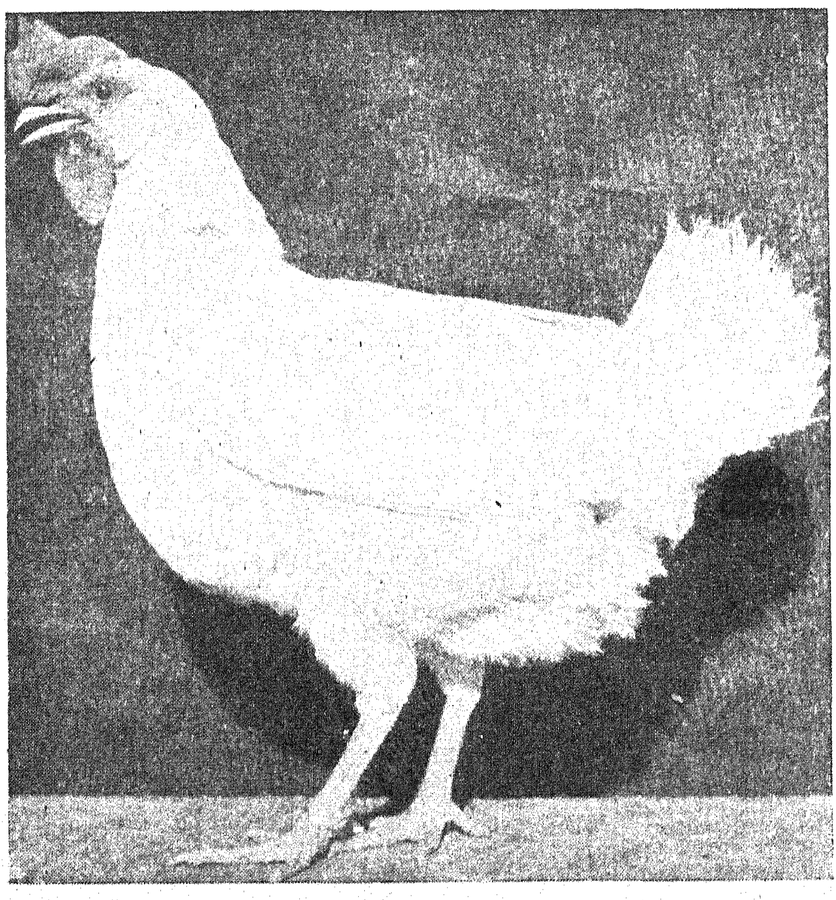
"Poultry Farming", Bulletin No. 241, *printed in November* 1943, *is out of print. A revised edition is expected to be available early next year. Only copies of the Afrikaans version are still available.*

Eighteenth Central Egg-Laying Competition.

Tenth Test of the Registered Breeders' Association.

J. A. de Beer, Test Manager, College of Agriculture, Glen.

THE above Egg-laying Competition and Breeders' Register Test began on 6 April 1943 and ended on 6 March 1944. Six-hundred and eighty hens were entered for the former, a decrease of 10 hens compared with the previous competition, and in the case of the Breeders' Register Test, 190 hens were entered, an increase of 110 hens as compared with the previous test. Owing to the fact that more applications were received than available accommodation permitted, breeders had to be limited to two pens per breed in the



A fine Leghorn hen.

Central Competition. In that competition pens of 5 hens each are entered, the performance of the best 4 birds only being taken into account. For the Registered Breeders' Association Test a pen consists of ten hens of which the best 8 birds are taken into account. These birds must be the off-spring of registered parents and the owner

must be a member of the Breeders' Register of the South African Poultry Breeders' Association.

Although these two contests differ and particulars are consequently given separately, they have the following points in common:—

(1) The methods of treatment, feeding and housing were indentical;

(2) the eggs were collected, weighed and recorded in the same way, and

(3) the contests began on the same day and extended over a period of 48 weeks, subdivided into 12 periods of 28 days each.

At the close of each period the egg production record and full details regarding positions, moulting, broodiness, sick hens treated, highest producers for the period, and general climatic conditions are sent to each competitor. The Colleges of Agriculture compete with one another and not with private owners.

Rations.

The method of feeding was the same as in previous years.

Owing to the shortage of maize and maize products the rations had to be changed three times during the contests. The various rations fed were as follows:—

CONSTITUENTS.	PERIODS. From 6/4/43 To 8/6/43.	From 9/6/43 To 29/6/43.	From 30/6/43 To 6/3/44.
	lb.	lb.	lb.
Yellow Mealiemeal..	—	31½	33½
Lucerne Meal......	10	10	10
Beanmeal..........	15	2½	2½
Wheaten Bran......	35	30	30
Meat and Bonemeal	5	7½	3
Carcase Meal.......	—	—	6
White Fish Meal...	5	5	5
Groundnut Oilcakes	5	5	5
Hominy Chop......	7½	—	—
Maize Germ Meal (Vermilco).......	5	—	—
Maize Germ Meal (Epic)...........	5	—	—
Bonemeal..........	3½	4½	2½
Oyster Shell Powder	3	3	3
Fine Salt..........	1	1	1
	Grain.	Grain.	Grain.
	Barley.....43, Wheat.... 14, Crushed yellow maize.. 29 } 1½ oz. per hen per day.	Crushed yellow maize } 2 oz. per hen per day.	Crushed yellow maize } 2 oz. per hen per day.

The egg recording and inspections were carried out in the same way as in previous years. Grade "A" eggs are those weighing 1⅞ ounces or more during the first period, and 2 ounces or more as from the second period. Grade "B" eggs are those weighing 1¾ ounces and more, but less than 1⅞ ounces during the first period, and 1¾ ounces or more, but less than 2 ounces, as from the second period. Grade "C" eggs are those weighing less than 1¾ ounces.

TABLE 1.—*Average Production per Hen:*

(1) (*a*) *Central Competition.*

Breed.	No. of hens.	Average per Hen. A.	B.	C.	Total.
White Leghorn	282	174·7	18·8	1·9	195·5
Black Australorp	117	179·0	14·0	1·8	195·8
R.I.R.	62	184·7	9·4	1·1	195·3
Light Sussex	9	121·1	19·5	2·0	142·6
Black Leghorn	5	144·0	26·8	0·0	170·8
Barred P.R.	29	149·9	25·6	1·5	177·1
Buff P.R.	7	161·2	5·1	3·4	169·8
White Wyandotte	5	208·2	15·8	0·8	224·8
White Australorp	32	146	43·7	3·4	193·2
TOTAL	548	172·8	18·6	1·8	186·7

(*b*) *Breeders' Register Test.*

White Leghorn	122	185·5	13·6	2·0	201·2
Black Australorp	39	156·6	8·4	1·0	166·1
Light Sussex	16	103·6	7·2	2·1	112·9
TOTAL	177	171·1	11·8	1·8	184·8

(2) *Central Competition: College of Agriculture.*

White Leghorn	22	186·7	8·0	0·7	195·5
Black Australorp	14	206·7	10·6	1·0	218·5
R.I. Red	9	207·2	4·5	0·5	212·3
Light Sussex	5	178·6	33·4	6·2	218·2
White Australorp	1	93·0	110·0	0·0	203·0
TOTAL	51	193·2	12·6	1·3	207·1

(3) *Central Competition including Colleges of Agriculture.*

White Leghorn	304	175·6	18·1	1·8	195·5
Black Australorp	131	182·0	14·4	1·7	198·1
R.I. Red	71	187·6	8·8	1·1	197·5
Light Sussex	14	141·6	24·5	3·5	169·7
Buff P.R.	7	161·2	5·1	3·4	169·8
Barred P.R.	29	149·9	25·6	1·5	177·1
White Wyandotte	5	208·2	15·8	0·8	224·8
White Australorp	33	144·4	45·7	3·3	193·5
Black Leghorn	5	144·0	26·8	0·0	170·8
TOTAL	559	174·5	18·1	1·8	194·5

If the figures of the Central Competition [see Table 1 (3)] are compared with those of the previous year, it will be seen that the average total production dropped by 6·2 per cent. The average total production of "A" eggs, however, increased by 1·4 per cent in comparison with the previous year, while the average total pro-

Average Prices of Potatoes (per 150 lb.) on Municipal Markets.

SEASON (1 July to 30 June).	Johannesburg.				Durban.		Pretoria.	Cape Town.	
	Transvaal.		N.M. Grade 1.		Natal.	O.F.S.	Transvaal.	Cape.	
	No. 1.	No. 2.	No. 2.	No. 3.	No. 1.	No. 1.	No. 1.	No. 1.	No. 2.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	6 9	6 2	8 10	8 1	8 10	8 4	6 9	8 2	6 2
1939–40	6 7	6 7	8 8	8 2	9 10	8 9	6 8	9 0	7 4
1940–41	14 2	13 4	18 6	18 5	16 10	17 1	14 7	15 7	13 11
1941–42	19 3	18 7	24 9	25 4	23 3	21 0	19 10	20 1	17 3
1942–43	13 7	12 6	15 8	15 11	16 9	17 8	15 2	15 0	11 10
1943—									
January	7 9	6 8	10 9	10 8	14 2	—	8 5	10 9	7 1
February	8 3	7 2	11 8	11 6	13 7	13 1	10 0	8 4	6 2
March	8 10	8 5	13 1	12 7	13 9	13 8	11 1	8 4	—
April	11 5	11 1	15 8	15 0	14 7	15 10	13 7	13 0	10 5
May	12 6	12 2	15 11	15 5	16 3	16 2	13 11	15 6	11 7
June	12 11	14 1	19 9	19 0	17 9	16 4	18 4	14 6	11 10
July	16 4	15 11	21 5	21 4	18 10	18 2	18 9	18 1	14 5
August	13 5	12 5	21 3	21 7	16 3	15 2	17 3	19 0	14 5
September	10 5	11 3	19 3	19 10	17 11	15 3	18 11	20 0	15 0
October	10 10	10 11	18 10	18 1	18 10	14 8	18 4	21 3	15 0
November	17 3	15 10	22 10	22 4	23 10	18 3	18 7	17 2	11 10
December	18 7	15 11	21 4	21 1	25 11	15 8	18 8	18 8	14 0
1944—									
January	13 11	11 4	16 11	16 7	22 9	20 3	17 4	17 6	12 11
February	13 8	11 4	17 11	18 1	24 10	25 0	18 0	18 11	15 11
March	14 4	13 4	17 9	17 11	19 10	19 7	16 6	14 10	11 6
April	23 1	21 11	30 2	30 4	29 9	25 11	25 4	30 2	24 0
May	27 10	26 7	30 7	29 6	29 4	28 10	29 2	28 10	26 3
June	29 8	27 8	—	—	30 0	29 11	29 7	29 8	28 4
July	30 0	—	—	—	29 6	29 11	28 3	30 0	30 0
August	33 1	—	—	—	30 0	32 7	35 3	30 9	32 3
September	36 5	—	—	—	—	—	36 0	—	—
October	36 11	—	—	—	—	—	—	—	—

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johannesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. Producers' Stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cow-peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939–40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940–41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941–42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942–43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943—									
January	5 0	4 5	7 3	5 5	27 3	27 3	33 7	21 4	21 1
February	5 0	6 6	7 2	5 0	34 2	34 2	30 1	22 8	23 3
March	5 6	5 3	7 3	5 4	29 6	29 6	34 8	26 3	27 1
April	5 6	—	7 5	5 3	21 7	21 9	35 7	27 1	24 10
May	5 7	—	7 5	5 4	21 8	21 8	41 6	28 3	28 9
June	6 7	6 9	7 5	5 5	21 4	22 1	42 1	28 7	29 3
July	6 11	6 6	7 9	5 8	24 6	25 6	46 9	29 9	31 10
August	7 0	6 6	7 9	5 8	24 7	25 0	53 11	33 0	32 4
September	7 4	6 8	7 9	5 7	23 8	24 4	55 6	34 6	34 8
October	6 2	5 7	7 4	5 6	22 9	23 9	54 7	33 8	32 11
November	4 9	4 7	6 9	4 11	21 9	22 6	53 1	34 5	35 7
December	4 6	4 2	6 9	5 4	21 3	21 3	59 10	31 6	22 5
1944—									
January	5 0	3 7	7 0	5 10	20 3	20 5	62 4	25 11	35 2
February	5 2	3 8	7 0	4 5	18 10	19 2	58 1	23 4	30 11
March	4 11	3 8	7 3	3 8	17 9	18 0	62 6	35 8	36 6
April	5 3	4 6	7 2	3 9	17 9	17 7	71 6	38 9	44 0
May	6 4	3 9	7 3	4 4	18 0	18 6	71 8	37 11	54 5
June	6 9	5 6	7 5	4 11	16 10	16 10	96 1	42 0	78 10
July	5 9	4 11	7 6	4 7	16 2	16 2	92 3	42 0	64 8
August	5 10	4 10	7 7	4 3	15 2	15 2	88 10	38 5	75 3
September	6 3	4 2	6 0	5 0	15 5	15 5	97 10	34 2	78 5
October	6 10	6 9	—	4 6	16 7	16 7	102 8	33 4	72 2

(a) Municipal Market.
(b) Seasonal year for Kaffircorn, 1 June–31 May. Dry Beans, 1 April–31 March; Lucerne and Teff, 1 July–30 June.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1 July to 30 June).	Green Beans (Pocket 20 lb.).			Green Peas (Pocket 20 lb.).			Carrots (Bag). (a).		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940–41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941–42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 10	17 2
1942–43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943—									
January	1 9	3 3	3 5	2 4	6 9	4 7	3 9	5 1	11 3
February	2 5	4 4	3 10	4 8	5 9	5 1	6 0	6 5	11 4
March	2 8	3 1	1 6	6 7	4 5	3 10	7 9	4 0	19 1
April	2 0	2 2	2 3	5 1	3 0	2 8	8 1	6 10	23 11
May	2 11	4 11	2 11	5 11	4 8	5 2	8 5	11 1	16 10
June	6 5	4 0	4 7	6 5	5 1	9 3	9 1	13 4	18 7
July	9 0	10 1	7 2	4 6	5 9	5 10	11 9	16 1	17 10
August	5 2	6 11	6 11	4 10	5 4	4 7	13 3	14 6	21 0
September	5 3	7 7	4 3	4 7	5 2	3 4	10 10	13 4	21 2
October	1 11	4 4	1 10	1 10	1 11	2 3	8 5	10 11	12 3
November	1 5	2 2	2 2	4 5	1 0	3 10	7 5	6 3	8 11
December	2 1	0 6	2 5	3 8	1 5	5 10	8 6	7 0	7 7
1944—									
January	1 9	1 2	3 5	4 7	1 6	6 7	7 4	3 5	7 10
February	4 4	2 1	4 0	7 2	—	5 9	9 0	6 0	15 1
March	2 8	3 8	2 0	6 9	5 0	6 6	13 6	8 11	24 5
April	1 10	1 11	1 4	3 7	2 3	4 6	10 3	12 5	35 1
May	3 5	2 10	2 9	7 4	5 3	4 11	9 10	12 7	27 0
June	6 6	9 1	5 4	7 9	6 4	6 5	11 10	13 6	20 6
July	4 9	8 4	5 3	4 1	4 7	5 7	9 11	13 11	19 0
August	5 0	4 9	6 7	2 8	2 6	3 6	6 10	11 6	14 1
September	3 10	6 2	6 7	5 5	3 5	4 3	7 11	12 3	17 4
October	4 8	6 0	5 7	5 4	2 5	8 0	7 11	10 4	10 4

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg; 130 lb. Cape Town; 90 lb.; and Durban; 120 lb.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1 July to 30 June).	Cabbages (Bag). (a)			Cauliflower (Bag). (a)			Tomatoes (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941–42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942–43	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943—										
January	5 1	9 0	12 6	—	—	—	4 11	2 4	2 6	2 8
February	6 4	10 2	15 2	5 7	5 8	—	5 5	2 7	1 8	2 11
March	5 6	9 6	8 6	6 6	5 11	—	3 11	1 9	1 10	2 7
April	4 1	9 5	8 1	3 2	6 1	7 4	3 4	1 7	2 2	3 1
May	4 5	6 0	7 9	3 10	5 0	7 0	4 10	2 6	2 3	2 6
June	7 6	5 5	12 8	8 7	6 1	11 11	7 2	3 8	4 0	3 6
July	10 4	6 7	11 1	8 5	5 3	11 0	7 11	4 5	3 10	2 1
August	12 4	6 8	11 6	7 1	5 5	10 8	7 11	4 8	4 9	2 8
September	17 0	6 8	11 8	14 5	6 8	13 5	8 5	4 3	4 5	2 5
October	7 10	8 0	11 4	8 10	6 5	6 2	8 3	4 2	4 4	2 3
November	10 5	5 7	14 11	12 7	6 0	3 9	4 0	2 0	2 10	1 1
December	9 8	4 0	8 7	7 4	5 10	—	4 2	1 7	3 2	1 8
1944—										
January	6 5	5 2	14 6	5 4	2 6	—	4 3	1 6	2 2	1 2
February	7 5	7 8	22 2	6 8	—	—	4 7	1 9	2 9	2 3
March	13 4	10 6	25 7	10 4	8 11	15 6	6 8	3 3	2 5	2 5
April	11 3	10 11	22 8	9 1	8 5	12 2	5 11	2 10	3 1	2 4
May	11 11	7 10	18 0	10 5	8 2	13 10	5 6	2 10	3 8	2 5
June	12 2	8 9	12 0	11 10	10 2	11 11	4 10	2 6	4 0	1 8
July	9 10	8 10	8 5	7 8	7 2	7 2	4 7	2 4	2 10	1 0
August	8 11	6 7	7 1	5 1	6 2	7 1	3 5	1 7	2 4	1 5
September	12 11	8 1	14 1	14 4	6 5	18 11	3 3	1 8	2 8	1 2
October	13 6	7 8	13 0	13 10	4 6	—	4 8	2 6	2 10	2 1

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 105 lb. Cape Town 105 lb., and Durban 90 lb. For cauliflower—Johannesburg 100 lb., Cape Town 65 lb., and Durban 85 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1 July to 30 June).	Eggs. Johannesburg, New-laid. Per Dozen.	Eggs. Durban, New-laid. Per Dozen.	Eggs. Cape Town. Per 100.	Fowls (Live, each). Johannesburg.	Fowls (Live, each). Durban.	Fowls (Live, each). Cape Town.	Turkeys (Live, each). Johannesburg.	Turkeys (Live, each). Durban.	Turkeys (Live, each). Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939–40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940–41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1942–43	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942–43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943—									
January	1 8	2 2	13 11	3 10	3 9	4 3	17 11	15 5	11 6
February	2 3	2 7	16 7	3 8	4 1	3 10	18 5	16 3	12 3
March	2 9	3 2	19 4	3 10	4 3	4 4	13 11	11 8	14 9
April	3 2	3 11	24 8	4 2	4 8	4 3	13 8	14 8	11 0
May	3 10	4 10	29 2	4 11	4 11	4 2	14 8	15 10	11 9
June	2 3	2 9	18 7	5 6	4 8	4 10	17 2	17 1	13 1
July	1 9	2 0	16 3	6 4	5 5	6 6	17 6	19 1	15 5
August	1 8	1 9	13 5	6 4	5 5	6 11	17 1	20 7	18 10
September	1 7	1 9	11 8	6 7	5 6	7 4	17 6	23 1	20 10
October	1 5	1 8	11 7	7 1	5 10	7 3	18 7	25 0	17 0
November	1 8	1 9	11 8	5 11	5 1	6 8	20 11	25 9	16 2
December	2 1	2 2	14 7	5 4	5 0	6 0	21 11	24 10	18 8
1944—									
January	2 4	2 4	17 3	4 7	4 10	5 0	16 10	19 4	13 11
February	2 7	2 9	19 2	4 3	4 10	4 4	14 9	20 10	12 10
March	2 10	2 9	19 10	4 1	4 11	4 7	13 5	18 3	13 4
April	3 2	3 5	24 5	4 2	5 3	4 1	15 0	17 0	13 8
May	3 2	3 6	24 9	5 0	5 5	4 2	13 8	15 8	13 11
June	3 0	3 3	20 1	5 7	5 7	5 1	14 10	16 9	13 9
July	1 9	2 1	16 8	5 11	5 9	6 4	16 2	15 11	16 4
August	1 4	1 4	12 10	6 1	5 9	6 9	19 3	20 1	19 1
September	1 4	1 5	10 8	5 5	5 10	5 4	21 11	26 4	24 1
October	1 6	1 6	12 4	4 11	5 6	5 7	26 11	28 5	23 9

Average Prices of Apples, Pears and Grapes on Municipal Markets.

Season (1 July to 30 June).	Apples (Bushel box). Johannesburg. Ohenimuri.	Apples. Johannesburg. White Winter Pearmain.	Apples. Johannesburg. Wemmershoek.	Apples. Cape Town. Ohenimuri.	Apples. Cape Town. White Winter Pearmain.	Apples. Cape Town. Wemmershoek.	Pears (Bushel box). Johannesburg. N.M. No. 1.	Pears. Johannesburg. Other.	Grapes (Tray). Johannesburg. All kinds.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41	8 4	7 1	6 4	8 11	10 8	5 0	8 11	6 3	1 8
1942–43	8 11	7 11	7 3	9 1	10 9	6 9	7 3	8 0	1 11
1942–43	14 9	11 6	9 1	10 8	12 11	6 11	—	10 8	1 10
1943—									
January	—	17 5	—	11 5	—	—	—	9 3	2 3
February	10 1	11 0	14 4	8 11	9 0	4 11	—	9 10	1 5
March	8 5	10 1	8 10	9 2	11 8	5 9	—	10 0	2 0
April	13 10	10 6	11 7	10 4	12 2	6 11	—	12 8	2 2
May	16 8	11 11	12 5	12 0	13 0	8 0	—	14 8	2 9
June	18 3	17 1	12 8	14 1	16 5	13 1	—	—	3 4
July	17 3	19 7	—	12 6	17 2	14 0	—	—	—
August	19 5	18 10	13 3	13 10	17 9	—	—	—	8 5
September	19 5	21 10	11 4	12 6	19 1	7 7	—	—	15 0
October	25 3	26 0	—	12 1	15 0	—	—	—	—
November	27 3	29 7	—	11 7	12 8	—	—	—	—
December	29 9	30 0	—	16 7	18 5	—	—	—	6 3
1944—									
January	15 1	—	18 0	16 10	—	—	—	20 7	3 7
February	12 4	—	13 2	11 0	—	6 9	—	14 2	3 5
March	8 7	8 5	8 1	9 8	12 6	5 7	—	13 11	2 11
April	11 6	10 4	11 5	9 2	11 0	5 8	—	15 9	3 11
May	12 8	9 3	10 7	11 3	11 3	6 0	—	18 10	3 10
June	13 3	10 4	8 6	11 7	13 8	8 2	—	23 11	3 7
July	14 0	13 5	12 3	11 6	14 6	5 10	—	22 7	12 4
August	17 8	15 6	12 4	11 10	16 3	—	—	—	7 8
September	14 5	16 2	12 6	11 7	17 9	—	—	—	—
October	16	13 7	11 7	11 1	20 2	7 10	—	—	—